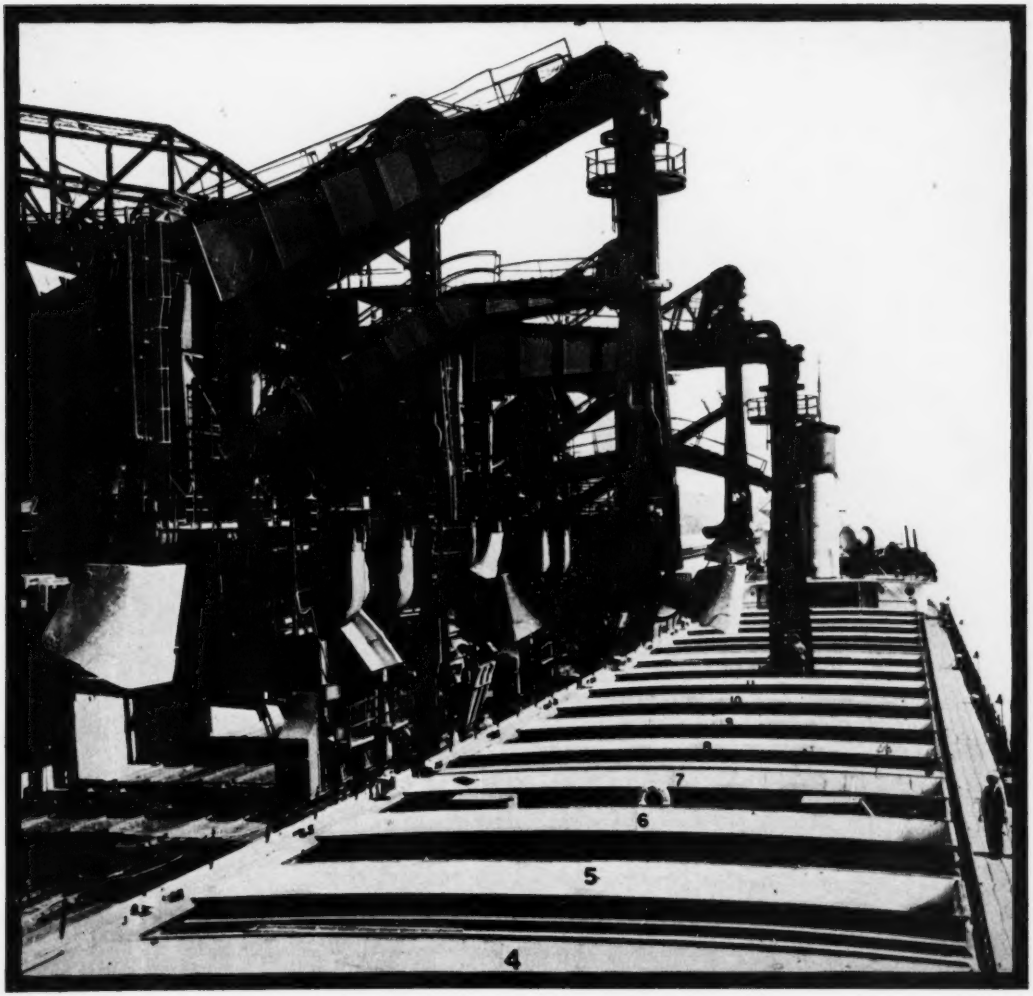
ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

APRIL 1949



Unloading iron ore at a Lake Erie port, as shipping season starts.

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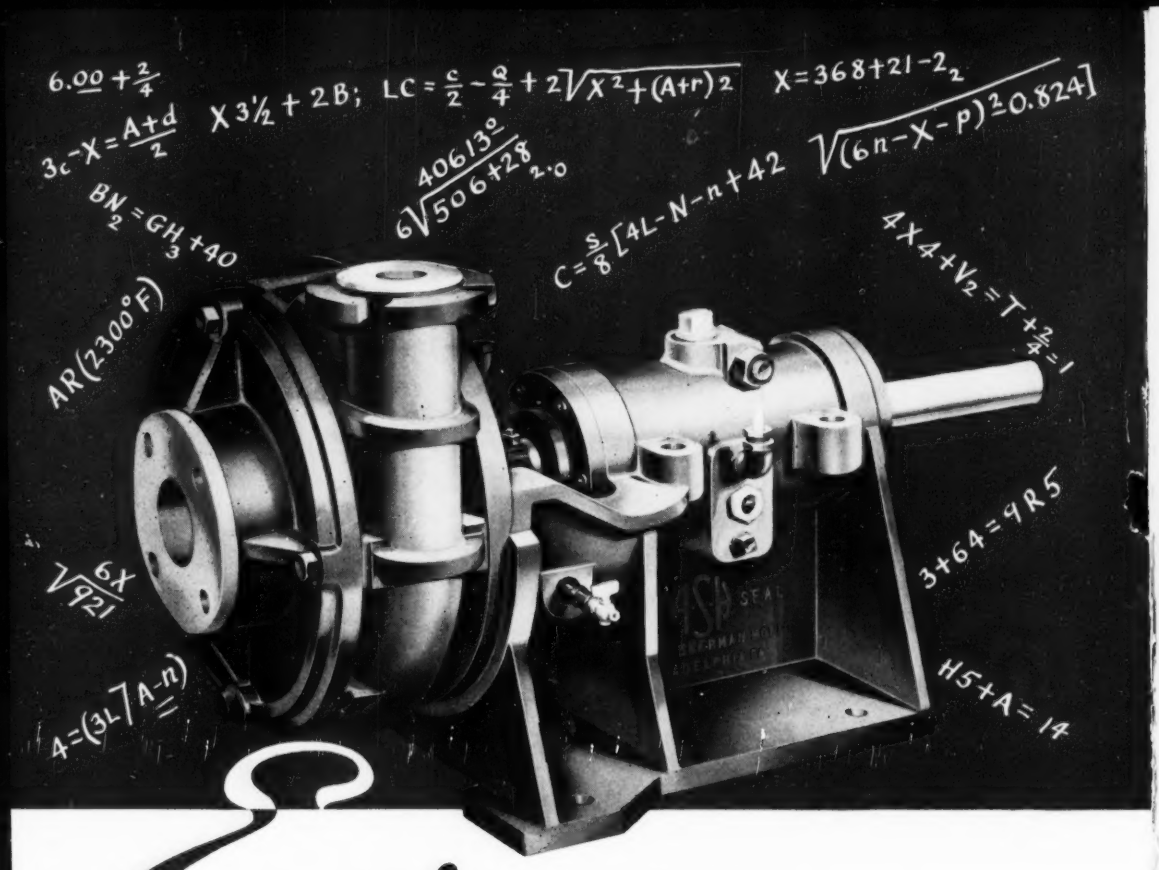

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ENGINEERING AND MINING JOURNAL

FOUNDED 1866

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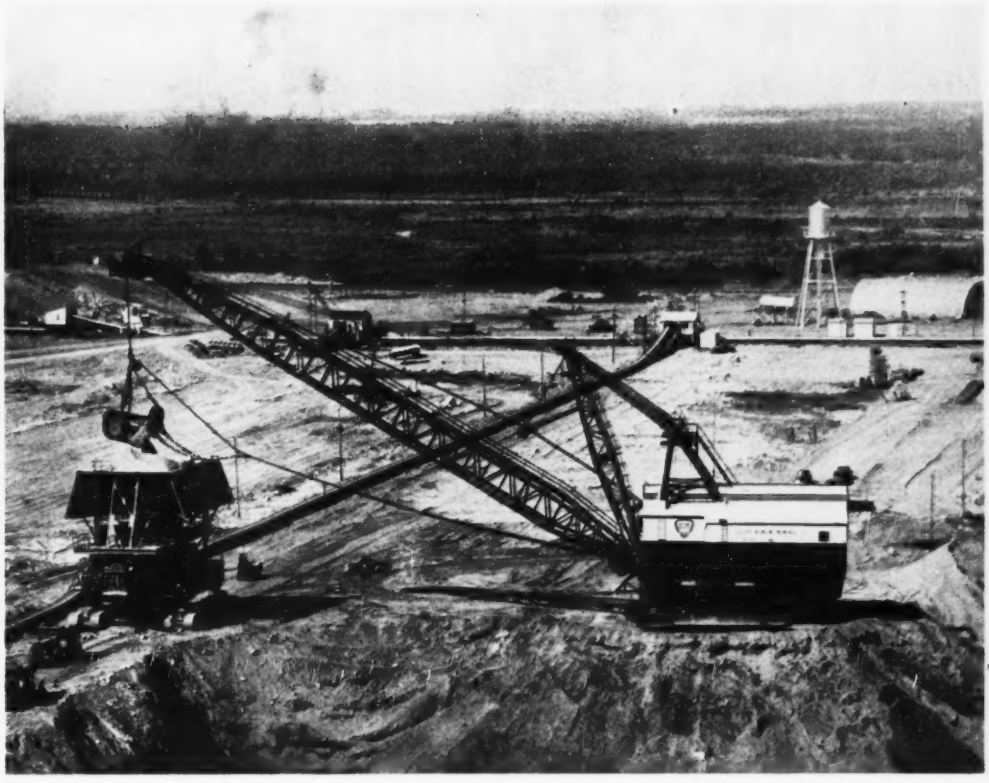

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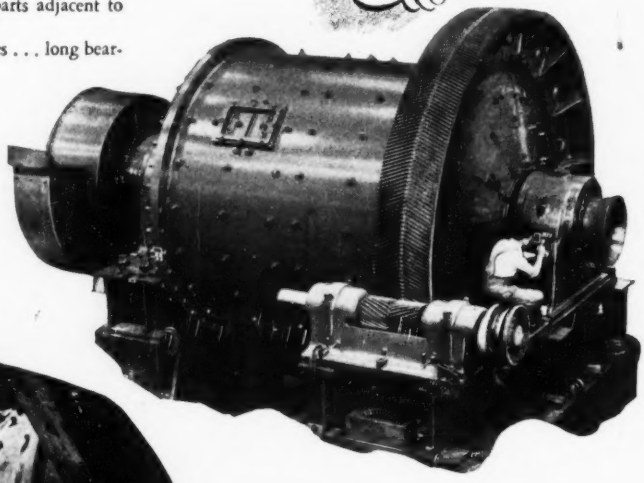

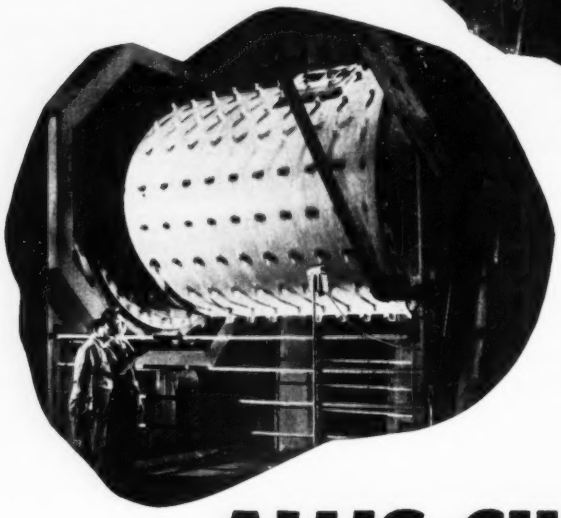

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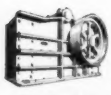
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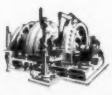
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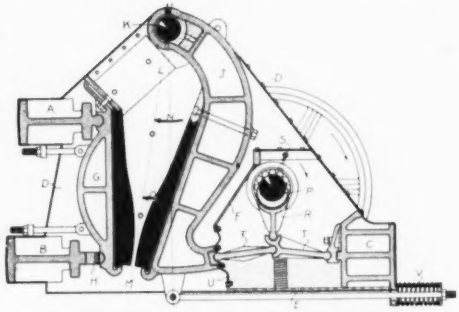
PRINCIPLE OF 1858. Blake or double-toggle crusher, designed 91 years ago. Swing jaw forces rock upward, with severe rubbing against jaws, causing rapid wear, and waste of power. Unbalanced mechanism means low speed and low capacity. See figure at left.

PRINCIPLE OF 1879. Overhead eccentric or single-toggle crusher. The moving jaw forces rock up and down, causing severe rubbing and excessive wear. Power is wasted, bearing pressures are very high and output is low with high power costs.



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Place point of a pencil compass on center of hinge-pin of old-style Blake crusher above and describe an arc anywhere along the face of swing jaw. Note how jaw *must* travel the path of this arc, and how this path of travel is upwards in relation to the stationary jaw. (Changing shape of jaw cannot change path of travel, which is established by location of hinge pin.) This means every piece of rock as it is being crushed is pushed upward, causing severe rubbing, extreme wear on jaw plates and wasted power.

Now, place compass point on center of hinge pin (K) in Kue-Ken diagram. Note that hinge pin is on center line of crushing zone. Describe an arc and note that path of travel is normal to both jaw faces. There is practically no upward movement, so rocks are crushed without rubbing and jaw plates last 5 to 10 times longer than any other crusher operating under equal conditions. Elimination of rubbing also makes big savings in power.

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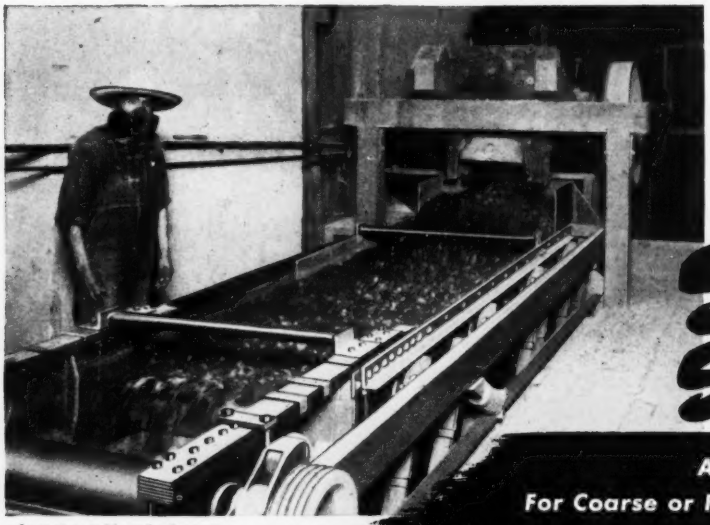

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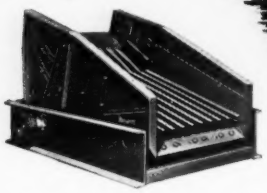

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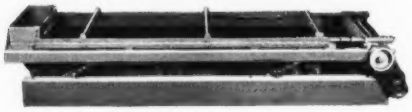
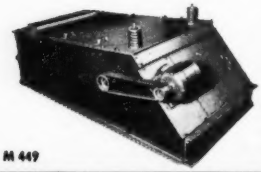
MILWAUKEE 7, WISCONSIN





M 449

ROD DECK SCREENS

Handles extremely heavy feeds on comparatively small openings, even with materials that are difficult to screen. Rapid discharge of the undersize gives this screen unusual capacity. Long life and easy rod replacement, plus high productive efficiency on difficult sizing jobs, result in low costs per ton of product screened.

HORIZONTAL VIBRATING SCREENS

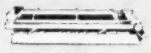
Recommended for extreme accuracy in sizing. Full floating construction and unusual horizontal screening action permits rapid and uniform travel of material without any deck inclination. Flat screen requires minimum headroom, simplifies installation in confined locations. Can be furnished in single, double and triple deck models in a wide range of widths and lengths for any capacity and separation desired.

NORDBERG

Machinery for processing ores and industrial minerals

Gyratory and Jaw Crushers

Symons Cone Crushers


Vibrating Screens and Grizzlies

Grinding Mills

Diesel Engines

Cuts Pump Upkeep

COST DOWN MORE THAN HALF IN 4 YEARS SERVICE AT MICH. CITY PLANT

SAYS A. C. LOHSE, General Power Engineer, Pullman-Standard Car Manufacturing Company — "Maintenance costs on our old pump were sky-high, so in March, 1945, we installed this *Electrifugal* pump to move condensate from our compressors and hydraulic pumps. It has run 16 hours a day, five days a week with only routine maintenance and one repacking. Cost per gallon is less than half what it was and performance is much more dependable."

This is the kind of dependable, cost-lowering service you can get from *Electrifugal* pumps. Motor and pump are mounted on *one* shaft in *one solid frame* for maximum rigidity. Feet are wide spread for firm support. Bronze ring protects casing from wear by impeller and is easily replaced when required.

Every *Electrifugal* pump is tested at the factory. Performance is guaranteed.

Allis-Chalmers makes hundreds of pumps for many types of service. For full information, see your A-C Authorized Dealer or District Office, or write for Bulletin 52B6059E. Also in Sweet's. A 2640

ALLIS-CHALMERS, 969A SO. 70 ST. MILWAUKEE, WIS.

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and District Offices throughout the country.

MOTORS — ½ to 25,000 HP and up. Matching Allis-Chalmers Control.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

Electrifugal, Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

2 TOURNAROCKERS

"These jobs will outpull anything I ever saw."

says RALPH PRICE of NICHOLAS DEVELOPMENT CO., INC.

STRIPPING approximately 750,000 yards of blasted rock and mixed earth for Babcock Coal and Coke at Babcock State Park, Nicholas Development Company, Inc., of Beckley, West Virginia, have found Tournarockers their most effective hauling equipment.

They have been using two of these revolutionary new LeTourneau 16-ton rock buggies for the past year to haul from a 2½-yard stripping shovel.

Average load every 4 minutes, 500' haul

Tournarockers are loaded with 6 passes from the well-heaped 2½-yard dipper . . . carry 14 bank yards. Checked on 500-foot, one-way haul, each rig averaged a round trip every four minutes including load, haul, dump and return. Road is average for strip-pit operation, slight favorable grade.

So fast was the haul cycle, that one of the two big-capacity Tournarockers was under the shovel at all times. Operation of the shovel was speeded up because big target area, measuring 11'2" x 7'10", plus the low body position of the Tournarocker, saved time each swing. Six dippers to a load also made for a faster shovel operation. There was also less spill than usual. The Tournarockers moved away from shovel faster than any equipment previously used by Hawkins and Price, owners of Nicholas Development Company, Inc. These haulers were off and away the instant the last pass was completed . . . took only seconds from a standing start to get rolling fast in 3rd gear.

Faster, cleaner on dump

On the dump, these versatile off-road hauling units also showed a lot of speed advantages. They backed into position quickly — saved time by eliminating usual turning and maneuvering. Because of front wheel drive and Tournarocker design, rear wheels could be backed onto the unstable fill edge, dump-

Send for Complete Facts

To: R. G. LeTOURNEAU, Inc., PEORIA, ILL. Please send information on E16 Tournarocker.

☐ Specifications ☐ Price ☐ Delivery ☐ Would like job analysis on present operations

NAME TITLE

COMPANY TYPE OF BUSINESS

STREET CITY, STATE

Would also like information on TOURNAPULLS: ☐ 7-yard "D" ☐ 13.3-yard "C" ☐ Big 30-yard "B"

speed coal stripping at West Virginia mine

Nicholas Development Co., Inc. like TOURNAROCKERS because:

1. **BIG TARGET** and low rear-entry for dipper gives fast loading.
2. **TOURNAMATIC DIFFERENTIAL** delivers more operating days during rainy weather.
3. **SHORT TURN RADIUS** permits close approach to bank, quick spot.
4. **LOADS DUMP CLEAR**... Tournarockers put rear wheels safely over bank... pull out easily with drive wheels always on the firm footing... most dump clean-up is eliminated.
5. **ELECTRIC STEER**, and safe, sure control at all times, eliminate severe operator fatigue common on other haulers.
6. **GIANT TIRES**, power-proportioning differential, and power steer, materially cut weather delays.
7. **4108 SQ. IN. BRAKE SURFACE** mean sure, safe stops, better control with bigger loads.

ing the load over the bank . . . practically eliminating need for dozer work on the dump.

Powerful brakes with 4,108 square inches of braking surface . . . *more on one wheel than most haulers have on the whole vehicle* . . . made this kind of handling safe. Big tires and front-wheel drive made it easy to pull back on top. Push-button steer gave quick maneuvering, and instant gear selection got the Tournarockers under way at top speed fast. The vertical dump position and wide clean lines of the body, cleared loads fast; and even when wet, no material remained in bowl.

Cuts weather delays

Ralph Price, one of the owners, and in charge of stripping operation on Sewell Mountain, says that the Tournarockers have been a big help in maintaining practically continuous operation all summer and fall in spite of rainy weather that would normally close jobs with other type haulers. "They go through where others hang up," was the way he explained it.

You, too, can profitably cut your haul costs and increase your profits with Tournarockers... why not get an analysis from your LeTourneau Distributor...NOW!

Tournapull-Trademark Reg. U. S. Pat. Off. Tournarocker-Trademark CM70

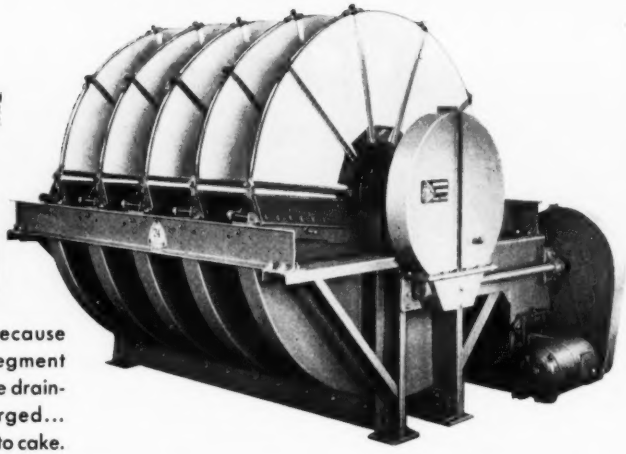
LETOURNEAU PEORIA, ILLINOIS **TOURNAROCKERS**

HIGH SPEED on RUBBER PLUS TRACTION ADVANTAGES of a CRAWLER

DRIER FILTER CAKE

with

DENVER DISC FILTER



Thicker and ***Drier*** filter cakes because PATENTED grooves in filter segment provide ***complete, positive*** filtrate drainage just ***before*** cake is discharged... prevents "blow-back" of filtrate into cake.

This photo shows:

Zinc feed	(45% moisture)
Filter cake	(8% moisture)
Feed per hour	1¼ Tons
Filter size	4'-Two Disc

FREE FILTERING TESTS

The Denver Ore Testing Division will conduct tests without charge to determine:

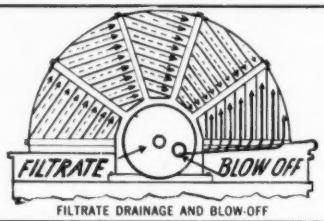
(a) Filtering rate of material.
(b) Size of filter required.
(c) Type of filtering media needed.
(d) Optimum speed.
(e) Moisture expected in cake.
(f) Vacuum equipment required.

We are anxious to work with your metallurgists.

WRITE US TODAY

PATENTED DESIGN

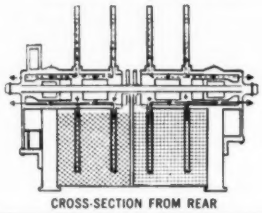
Patented grooves in filter segment drain direct to "suction and blow-off tube" which extends along leading edge of segment. This design increases suction efficiency... collects thicker, more uniform cake... means positive drainage just *before* "blow-off" and discharge of cake.



FILTRATE DRAINAGE AND BLOW-OFF

VALVES. . . . . .

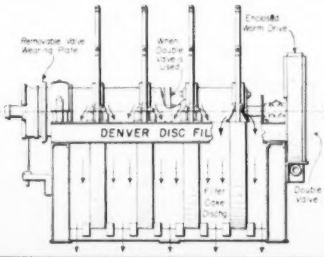
Double valves and divided tank can be provided... gives flexibility where two products are being treated. Use of two outlets permits separation of filtrates (strong solution from weak solution) where washing cycle is used... gives higher flow capacities if desired.



CROSS-SECTION FROM REAR

CONSTRUCTION. .

Wearing parts are protected and easily replaced. Bearings are protected from muck and dirt. Tank and frame are double-welded steel construction. Filter is compact... gives greater filter area in less floor-space, less head room.



"The firm that makes its friends happier, healthier and wealthier"

DENVER EQUIPMENT COMPANY

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They tote thousands of tons per day

in the world's deepest limestone "mine"

BURIED half a mile under Ohio is the world's deepest "quarry"—a mine that produces limestone at the rate of thousands of tons per working day. And every ounce of that river of rock rides on Goodyear Conveyor Belts for much of the way between the working faces of the mine and storage bins located on the surface.

When the mine owner called in the G.T.M.—Goodyear Technical Man—to recommend the belts best suited to conveyorize the operation, he specified Goodyear Stacker Conveyor to carry the limestone from crusher to storage bins—both located deep in the mine. Three belts—each 42" wide, 7-ply construction—were installed to handle this part of the operation. The G.T.M. recommended Stacker Conveyor because Stacker's extremely tough covers and bonding breaker are more than strong enough to handle the severe abrasion of the rock.

At the shaft head, the crushed rock travels from head frame to storage bins via nearly a half mile of Goodyear 6-ply, 32-oz. duck belting, installed on seven different conveyors handling various sizes of rock.

Altogether, this mine uses a total of ten Goodyear conveyor belts—all installed in accordance with the recommendations of the G.T.M. His recommendations can be your own best insurance of economical, long-life conveyor belt haulage, either above ground or below surface. It will pay you to consult the G.T.M. first. Write him c/o Goodyear, Akron 16, Ohio.

For Hose, Flat Belts, V-Belts, Molded Goods, Packing, Tank Lining *built to the world's highest standard of quality, phone your nearest Goodyear Industrial Rubber Products Distributor.*

We think you'll like "THE GREATEST STORY EVER TOLD" Every Sunday—ABC Network

GOODYEAR

THE GREATEST NAME IN RUBBER

W-SPEED PATROL BD-3

BD-2 AD-3 AD-4

Choose the size

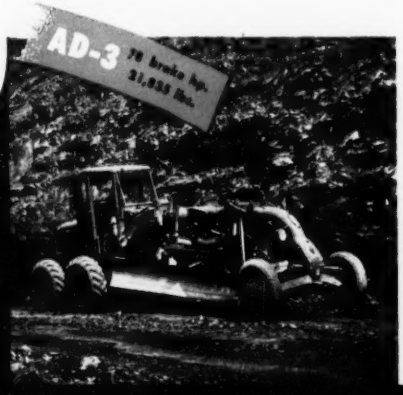
FROM ALLIS-CHALMERS' COMPLETE LINE

FOUR DIESEL-POWERED MODELS—all are full-fledged construction machines—each one easily handles all the work involved in the building and maintenance of haul roads and access roads—including cutting banks and ditches . . . also, with scarifier for ripping up shale and other tough material on stripping . . . and with snowplow, to keep roads open. Differences in weight, speeds, horsepower and cost enable you to match the machine to the job to be done.

LOW COST W-SPEED PATROL—especially economical motor grader for maintaining access roads and haul roads. Small size and short turning radius make it ideal for operation in narrow quarters. Available with broom for sweeping walks and driveways of debris and snow around your buildings; other uses. Gasoline powered, electric lights and starter, simple-to-operate controls.

Whatever your motor grader needs . . . your Allis-Chalmers dealer can fill 'em!

SAME OUTSTANDING ADVANTAGES ON ALL AD AND BD MODELS



ALLIS-CHALMERS

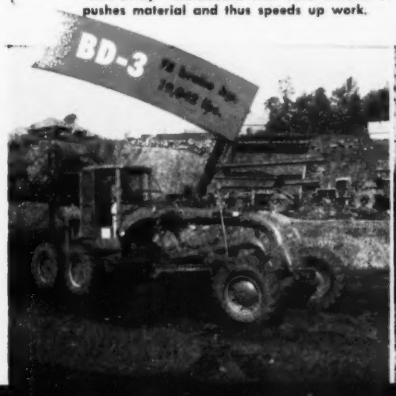
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

that fits the job

- A strong, shock-absorbing tubular frame that also protects control rods inside frame.
- High axle and throat clearance for handling bigger windrows without interference.
- Rounded construction of steering knuckles, spindles and drag links to prevent material from packing . . . assures unhindered operation.
- "Roll-away" moldboard that rolls instead of pushes material and thus speeds up work.
- A full circle revolving blade that allows grading forward or in reverse.
- A blade held firmly on its work, through direct down pressure, for precision cutting.
- A smooth-running, economical GM 2-cycle diesel engine that packs power in every stroke.
- Complete operator comfort with full vision, responsive controls, self-energizing brakes.

VERSATILE

FOR ALL KINDS OF USERS
FOR ALL TYPES OF MAINTENANCE



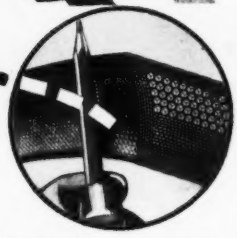
Make this Test with ANY V-Belt

You'll See at Once Why the

CONCAVE SIDE---

(U.S. Patent No. 1813698)

Saves You Money!



Bend any V-Belt and feel the sides change shape. The top of the belt, under tension, *narrows*. The body, under compression, *widens*. The sides of the belt bulge out.

The result, if the belt is built with *straight sides*, is a shape that does not fit the sheave groove—as shown in Figures 1 and 1A, below.

Straight-Sided V-Belt

How Straight-Sided V-Belt Bulges in Sheave-Groove

Clearly, the bulging of the sides will produce excessive wear along the *middle* of the sidewall as indicated by arrows.

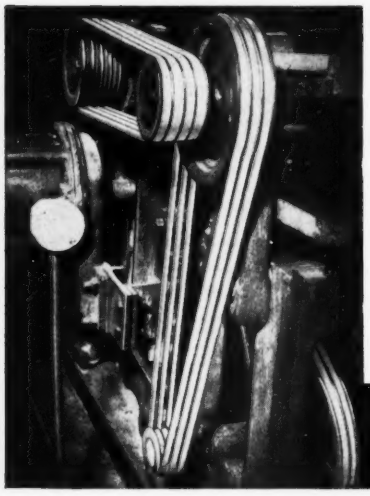
Now, bend a V-belt with the *concave* side—the Gates Vulco Rope.

You get the same shape change but *now* the new shape exactly fits the sheave groove—as shown in Figures 2 and 2A.

Gates Vulco Rope with Concave Side.

No Side Bulge. Precise Fit in Sheave-Groove.

Results? (1) *Uniform* sidewall wear; *longer life!* (2) Full sidewall grip on the pulley. Carries heavier loads and *sudden load increases* without slippage; saves *belts* and also saves *power!*



The Concave Side is *MORE IMPORTANT* NOW Than Ever Before

Because the *sides* of a V-Belt are what actually *drive* the pulley, it is clear that any increased load on the belt means a heavier load that must be transmitted to the pulley *directly* through the belt's sidewalls.

Now that Gates SPECIALIZED Research has made available to you SUPER Vulco Ropes—carrying fully 40% higher horsepower ratings—the life-prolonging Concave Side is naturally more important in conserving belt life today than ever before.

THE GATES RUBBER COMPANY
DENVER, U.S.A.
The World's Largest Makers of V-Belts

494

Gates

The Mark of SPECIALIZED Research

GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

who's who IN THE MINING INDUSTRY

The Eimco RockerShovel customer list is another way of writing the Who's Who in the mining industry.

Wherever mining is done on the 7 continents and many islands of the seas — there you'll find Eimco RockerShovels — serving faithfully day after day, shift after shift through the years.

Eimco's have been chosen repeatedly to replace other types of equipment because Eimco's load faster, better, easier and cheaper. Eimco RockerShovels are designed and built by mining men in a mining district.

RockerShovels, the original successful loading equipment, can lower your loading costs. If you do not have RockerShovels in your mine—write for information. You'll be amazed at the low cost of operating these machines, both in maintenance and air consumption.

EIMCO

THE EIMCO CORPORATION

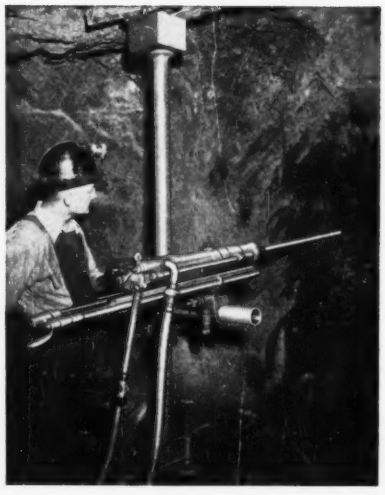
For Faster

▲ WITH 25% MORE POWER

Newly designed rotary air motor makes new CP-55 Diamond Drill 25% more powerful than the well known CP-5 — without increasing over-all weight.

Conservatively rated at 500 feet with E-EX fittings . . . has exceptional drilling speed . . . weighs only 160 pounds . . . packs an abundance of power . . . is easy to handle . . . requires a minimum of compressed air per foot drilled.

Designed for both coring and non-coring operations; blast hole couplings can be supplied when desired. Write for Bulletin 318.



LATEST OF THE CP DRIFTERS ▶

With a rotary motor built into the drill, the CP ROTORdrifter offers these important advantages: shorter over-all length . . . lighter weight . . . a single air hose . . . drill and feed controls both located in backhead . . . exceptional drill balance . . . smooth operation, with lessened vibration . . . minimum number of working parts . . . low upkeep.

Two sizes: CP-50N of 3″ cylinder bore; CP-60N of 3½″ cylinder bore. Write for full information on these and other CP drifters.

Drilling

a complete line of CP Rock Drills

FOR HARD, ABRASIVE FORMATIONS

Meeting the requirements of the most difficult drilling jobs, with its heavy piston blow and strong rotation, the 120-pound, heavy-duty CP-44 Self-Rotating Stoper has a streamlined design . . . holding handle correctly positioned for proper operating balance . . . high drilling speed and rotative power . . . steady air blow and hooded chuck to keep cuttings out of front end . . . button-operated air control that makes hole starting easy.

For soft to medium formations the 95-pound CP-34 is recommended. Write for complete information on CP Stopers.

NEW 14-POUND DRILL FOR MAINTENANCE WORK

From the new 14-pound CP-14 self-rotating Handril, for general maintenance work, to the CP-60N 119-pound Spring Handle Sinker for the heaviest tasks, the complete line of CP Sinker Drills provides just the right drill for every type of job. Write for detailed information.

Photo Courtesy of Bureau of Reclamation

REDUCES DRILLING COSTS

Providing fast and easy operation of the more powerful CP drifter drills, the lightweight G-200R Wagon Drill drills holes at any angle . . . is easily moved over uneven ground. Available with CP-50N (3″), CP-60N (3½″), or CP-70 (4″) Drifters. Write for SP-1980.

THE CONSOLIDATED PNEUMATIC TOOL COMPANY

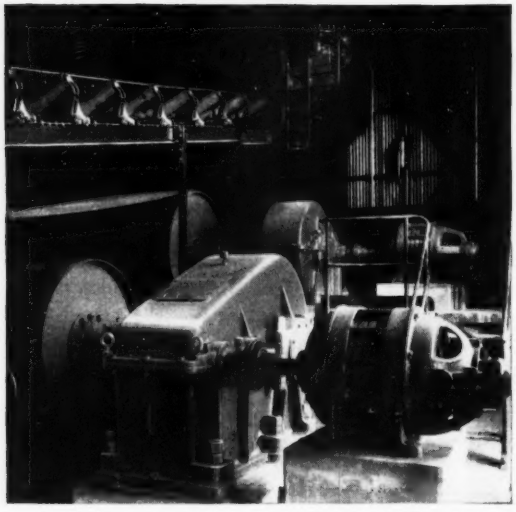
London, Bombay, Brussels, Johannesburg, Melbourne, Paris, Rotterdam

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

ELECTRIC TOOLS • PNEUMATIC TOOLS • AIR COMPRESSORS • ROCK DRILLS
DIESEL ENGINES • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

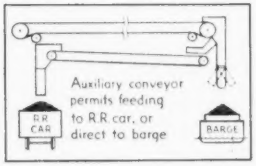
Why Link-Belt leads in belt conveyor engineering



Terminal belt conveyor drive equipment at Robena Mine (above). The success of Link-Belt conveyor installations in raising production rates and cutting handling costs is due not only to the most advanced design and construction of Link-Belt manufactured components, such as carrying and return idlers, terminal and drive machinery, welded steel pulleys, and highly efficient speed reducers, but to broad engineering experience in integrating these elements most effectively.

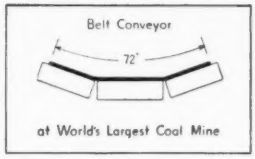
LONGEST

belt conveyor in the mining industry (10,900 ft.) for a metallurgical coal mine in West Virginia.



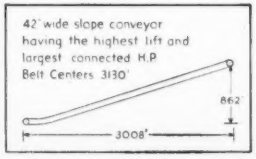
WIDEST

belt conveyor in the mining industry (72" belt), installed at the largest coal mine (Robena Mine of H. C. Frick Coke Company).



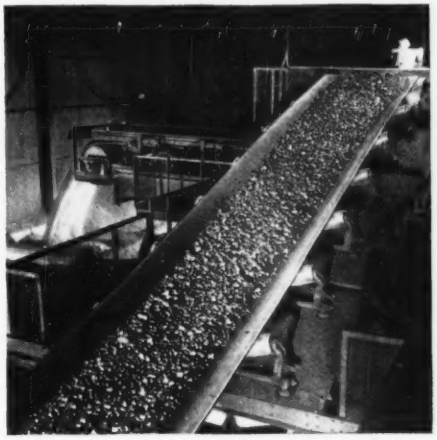
HIGHEST

lift (862 ft.) in the mining industry for a Southern Illinois coal mine.



Tough handling jobs are made easy by Link-Belt, through long and wide engineering experience with integration of standardized equipment.

Above: 1700 ft. long belt conveyor in the mining industry. One of a number of Link-Belt slope belt conveyors installed on the iron range. Below: 72" wide belt conveyor delivering coal to shuttle belt conveyor.



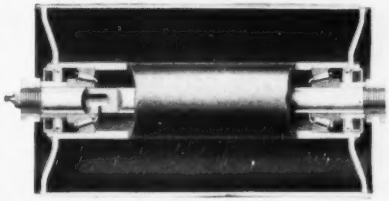
For details of these and other Link-Belt conveyor installations, get in touch with our nearest office.

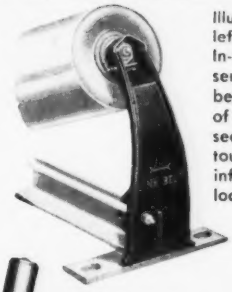
LINK-BELT COMPANY 11.413

Chicago 9, Philadelphia 40, Pittsburgh 13, Wilkes-Barre, Huntington, W. Va., Denver 2, Kansas City 6, Mo., Cleveland 13, Indianapolis 6, Detroit 4, Minneapolis 5, Birmingham 3, St. Louis 1, Los Angeles 33, San Francisco 24, Seattle 4, Toronto 8.

LINK-BELT *Belt Conveyor Idlers*

The Link-Belt "100" belt conveyor idler is the culmination of more than half a century of experience and development.



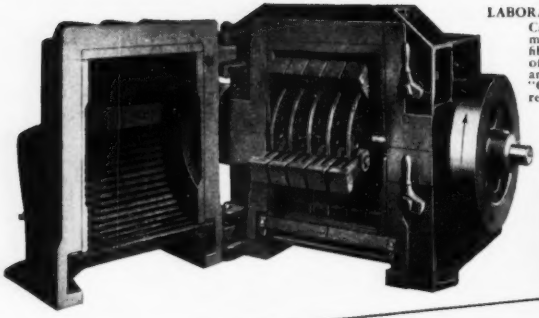


Illustrations above and to the left show the positive Grease-In-Dirt-Out Seal which conserves lubricant and prolongs bearing life . . . cross-section of roll, showing shaft, grease seals and roller bearings . . . tough malleable bracket in reinforced T-section to withstand load and impact.

Link-Belt positive action self-aligning troughing idler. For details on Link-Belt belt conveyor equipment, ask for Book 1915.

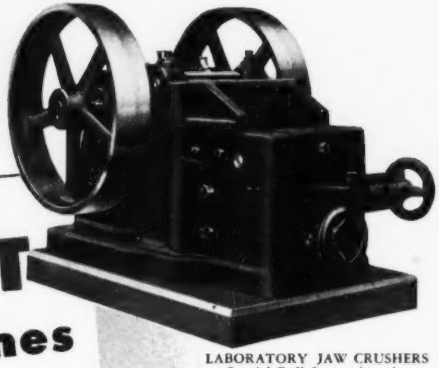
LINK-BELT CONVEYORS

HANDLING EQUIPMENT . . . POWER TRANSMISSION MACHINERY



LABORATORY SWING-SLEDGE MILLS

Capable of reducing soft, moderately hard and tough or fibrous materials to any degree of fineness between 1 in. and 20 mesh. The patented "Open-Door" feature permits ready accessibility for cleaning.



STURTEVANT

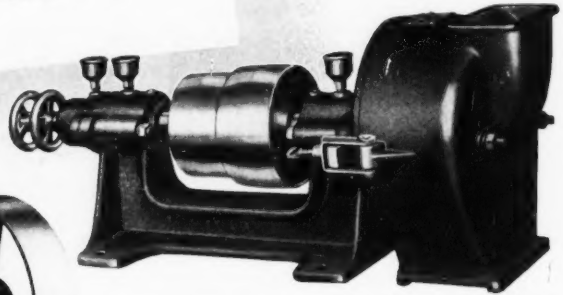
Laboratory Machines

Assure Quality of Products

Fast - Economical - Accurate

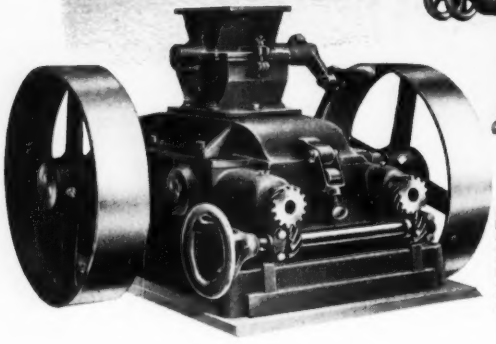
LABORATORY JAW CRUSHERS

Special Roll Jaw action simplifies close regulation of the product with capacities varying from 300 or 400 lbs. per hour at finest settings, to 1000 or 2000 lbs. when opened for coarser work. Each part of the crusher is accessible for quick and easy cleaning.



LABORATORY SAMPLE GRINDER

Laboratory Sample Grinders are of the "Open-Door" disc type and are capable of very fine work, producing products as fine as 100 mesh (coarser if desired) when working on dry, friable, soft or moderately hard materials. Simply turn hand wheel to provide product regulation from 10 to 100 mesh.



LABORATORY CRUSHING ROLLS

First designed especially for laboratory sampling work, Sturtevant Crushing Rolls are used regularly in many plants where there are limited outputs. Range of output for the 8 x 5 size is from ½ in. to 20 mesh — and for the 12 x 12 size from ¾ in. to 20 mesh.

The only sure way to maintain strict quality of products is laboratory control . . . and that calls for accurate sampling.

Sturtevant Laboratory Equipment meets the exacting requirements of laboratory work. They are fast and accurate . . . provide true samples.

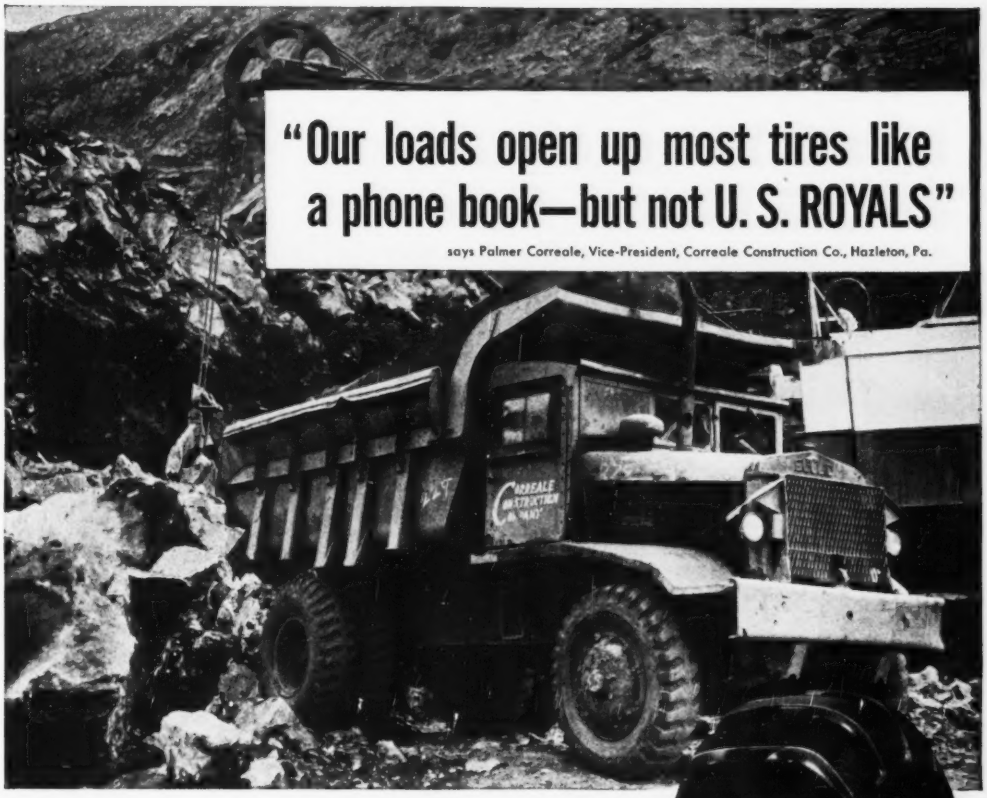
Rugged and dependable, Sturtevant equipment actually has all the features of full size machines plus extra accuracy and wider range of adjustment. The "Open-Door" accessibility permits quick, thorough cleaning . . . prevents the possibility of previous batches from contaminating new samples.

Investigate Sturtevant equipment for your laboratory. It will cut your sampling costs . . . help maintain strict quality of products . . . increase sales. Write for complete details and catalog.

STURTEVANT MILL COMPANY

101 CLAYTON STREET, BOSTON 22, MASS.

Designers and Manufacturers of: CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS • MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS



"Our loads open up most tires like a phone book—but not U. S. ROYALS"

says Palmer Correale, Vice-President, Correale Construction Co., Hazleton, Pa.

"OUR TIRES OFTEN CARRY 35-TON LOADS... IN ALL WEATHER...21 HOURS A DAY!

"... Our Beechwood stripping operation is so deep that our trucks must haul coal and rock up grades of more than 10%. We cannot afford slipping, sliding or tire failure on the job. That's why we've tested and selected U. S. Royal Con-trak-tors."

U. S. ROYAL CON-TRAK-TOR. Just look at all the *extras* built right into this rugged tire:

- **CUT-RESISTING TREAD** with deep cleats gives your trucks 2-way traction.
- **ROUNDED SHOULDERS** improve flotation in soft going.
- **SHOCK PAD CONSTRUCTION** guards against rupture.

U. S. FLEET SERVICE. Your U. S. Royal Distributor is ready to draw up a tailor-made preventive tire maintenance plan designed especially for your operation—a plan which can give you lower cost per tire mile! He'll give you service where it counts—on your job! Call your U. S. Royal Distributor today. He's listed in your Classified Telephone Directory.

The finest tires you can buy are

U. S. ROYALS *by* U. S. RUBBER

U.S. ROYAL TIRES

Jeffrey

This photo shows the stacker and trailing conveyor designed to reach an ultimate length of 2,500 feet when on the horizontal as dump progresses. The trailing truss section is about 100 feet long and contains the power and propelling mechanism to pull trailing conveyor forward enough to install additional sections as needed.

● Jeffrey presents a unique trailing conveyor and stacker system for handling and stacking overburden on the Mesabi Iron Range. Starting with the trailing truss section, Jeffrey furnished the 245 foot long stacker complete, including all idlers, machinery parts, propelling mechanism and drives. In fact, the stacker was completely designed and built by Jeffrey.

In the loading hopper Jeffrey furnished the two 60″ wide belt conveyors and machinery parts. Also the small transfer hopper complete including all steel work, idlers and propelling mechanism. From the loading hopper back to the stacker trailing truss section, a total length of 9,831 lineal feet, all troughing and return idlers, pulleys, bearings and shafting for the 48″ wide main conveyors were furnished by Jeffrey.

When it comes to material handling jobs, large or small, you can depend upon Jeffrey equipment. Jeffrey has the engineering experience—the engineering staff—and the facilities to help you. Consult Jeffrey on your material handling jobs.

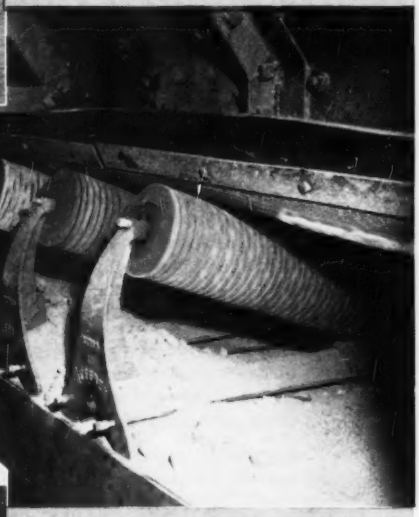
General view of loading arrangement and conveyor for moving over-burden from loading hopper. The drag line and loading hopper are shown at the top, center.

This view shows the conveyor loading up to the stacker. From the photo above and this one you can get a fairly good idea of the size of this project. The total conveyor length is 9,831 lineal feet.

Conveyors

HANDLE OVERBURDEN ON MESABI IRON RANGE

This photo will give you an excellent idea of the size of the conveying job on this installation. It shows a stack of Jeffrey troughing idlers waiting for installation. These are only a part of the hundreds of Jeffrey idlers required for this unique conveyor set-up.



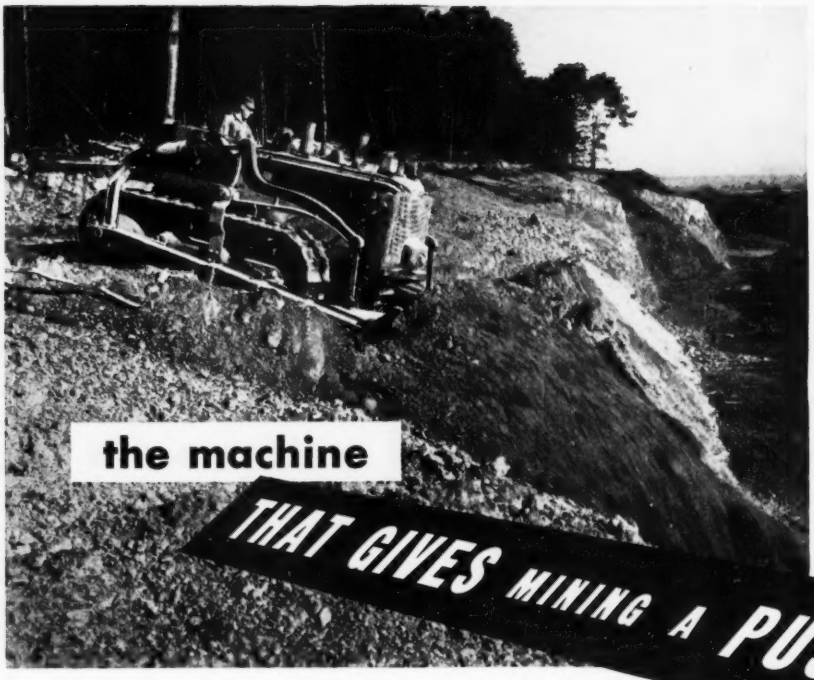
Showing Jeffrey rubber-covered idlers installed beneath the hopper of the traveling screening plant. These idlers take the brunt of the punishment caused by the large pieces of rock that come through the screen onto the 60" belt—save wear and tear on the belt.

Here is a view of the stacker discharging onto fill. Note the height of this fill and you will realize the vast amount of material handled and the flexibility of the equipment used on the job. Jeffrey's experience in designing and building stackers and conveying equipment is evidenced in the accompanying views of this Mesabi Iron Range installation.

THE JEFFREY MANUFACTURING COMPANY

974-99 NORTH FOURTH STREET, COLUMBUS 16, OHIO

Birmingham 3 Chicago 1 Denver 2 Houston 2 Milwaukee 2 Pittsburgh 22
Boston 16 Cincinnati 2 Detroit 19 Huntington 19 New York 7 St. Louis 3
Buffalo 2 Cleveland 15 Huntington 19 Philadelphia 3 Salt Lake City 1



BUCYRUS ERIE

the machine

THAT GIVES MINING A PUSH

Bucyrus-Erie hydraulic Bullgraders and Bulldozers are built for International industrial models TD-6, TD-9, TD-14 and TD-18; cable Bullgraders and Bulldozers for TD-14, TD-18 and TD-24.

Overburden strippers — scraper pushers — back fillers — pit maintainers — tailing pilers — ditch diggers — road builders — versatile Bucyrus-Erie Bulldozers and Bullgraders are busy every minute doing dozens of time and dollar-saving jobs.

The B-E hydraulic system provides extra powerful down pressure on the blade — a "must" for removing frozen overburden, for jackknifing tractor out of sticky mud in placer operations or for any job where positive blade down pressure is needed.

Bucyrus-Erie units are built so that heavy parts are mounted toward the rear of the tractor thus balancing the blade at front. You can run these outfits right to the edge of a dump — no nosing down — no balance upset.

Scientifically curved B-E blade rolls dirt instead of pushing it — less horsepower needed, less fuel used, more yards per hour stripped. Bullgraders and Bulldozers are mounted so that operator can stay seated and still see just what his blade is doing — no high superstructures to block his view. He can angle or tilt his Bullgrader blade in a few minutes — so easily he makes full use of angle and tilt features.

Your International industrial dealer can give you more facts on the performance of Bucyrus-Erie Bulldozers and Bullgraders in mining operations. See him for full details.

BUCYRUS-ERIE COMPANY • So. Milwaukee, Wis.

125748

See Your INTERNATIONAL Industrial Tractor Distributor

THE *120* CONWAY SHOVEL

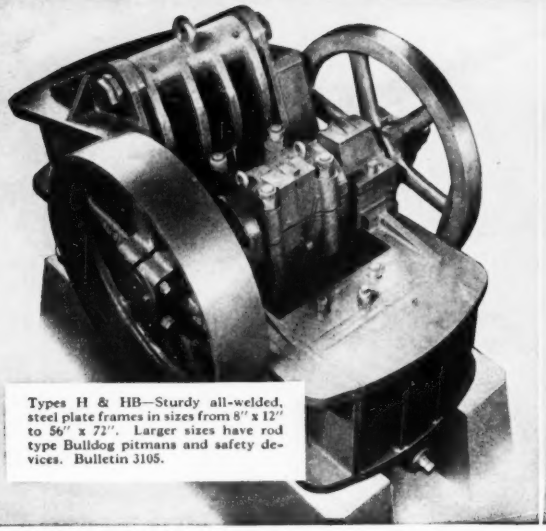
for

DRIVING METAL MINE DRIFTS IN HARD ROCK AND ORE

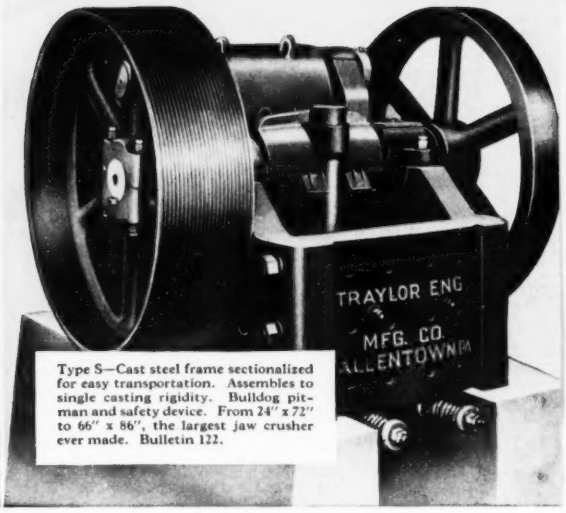
The Type 120 Conway is a powerful little mucking machine with a low operating height. A trailing electric cable provides a liberal tramming range for pickup of flyrock, a wide swing of the loading boom permits good cleanup at the muck pile, the ability to dig below track level allows grade to be maintained without hand shoveling. It is a fast working machine easily capable of 7 complete loading cycles per minute.

GOODMAN MANUFACTURING COMPANY

HALSTED ST. AT 48TH • CHICAGO 9, ILL.

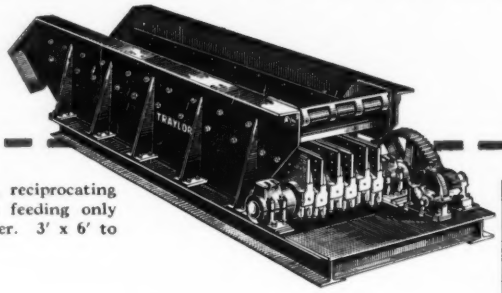


Types H & HB—Sturdy all-welded, steel plate frames in sizes from 8″ x 12″ to 56″ x 72″. Larger sizes have rod type Bulldog pitmans and safety devices. Bulletin 3105.

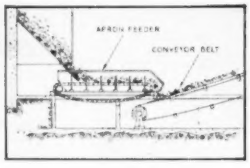


Type S—Cast steel frame sectionalized for easy transportation. Assembles to single casting rigidity. Bulldog pitman and safety device. From 24″ x 72″ to 66″ x 86″, the largest jaw crusher ever made. Bulletin 122.

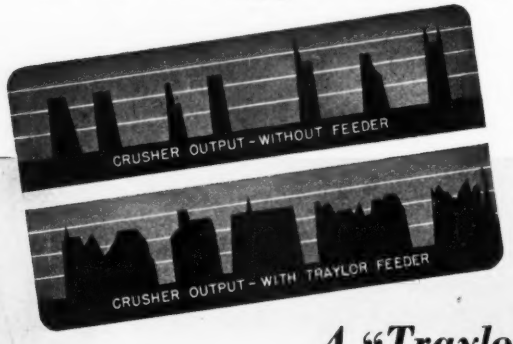
TRAYLOR TEAMS SET



Grizzley Feeder—Spaced, reciprocating bars remove fines while feeding only coarse material to crusher. 3′ x 6′ to 10′ x 20′. Bulletin 114.



Star Performers Team Up to Win Bigger Profits

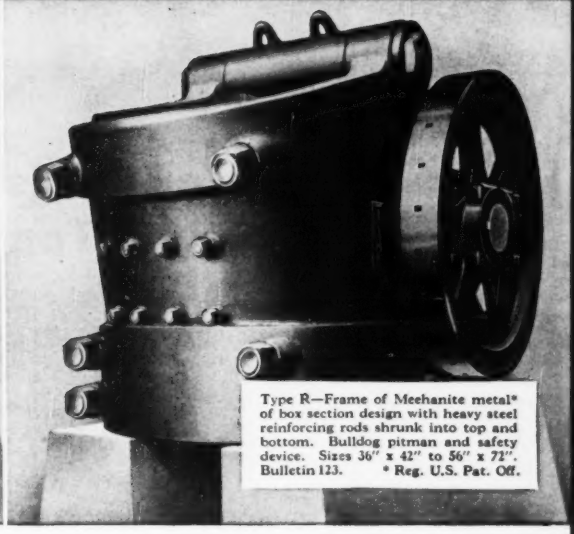


The unsurpassed production from Traylor Jaw Crushers reaches its peak when material is supplied to them in controlled quantities with Traylor Feeders. The performance chart below demonstrates the ability of Traylor Feeders to maintain maximum crusher production with minimum power costs. Traylor Crushers with non-chokable, smooth-faced, curved jaw plates easily keep pace with a full, steady

This chart shows clearly why crusher production can be more than doubled when material flow is controlled with a Traylor Feeder.

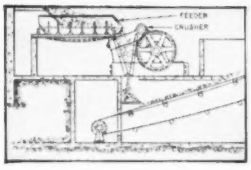
A "Traylor" Leads to Greater Profits

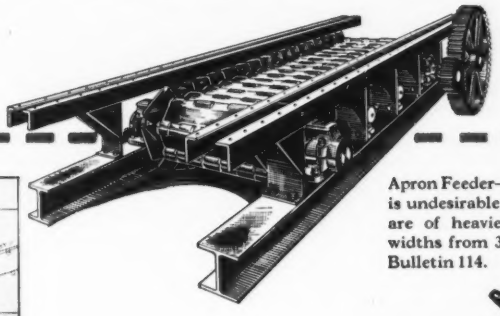
Type M-Rugged frame of Meehanite metal* with three heavy flanges. Sizes from 8″ x 12″ to 30″ x 42″. Bulletin 124.
*Reg. U.S. Pat. Off.



Type R—Frame of Meehanite metal* of box section design with heavy steel reinforcing rods shrunk into top and bottom. Bulldog pitman and safety device. Sizes 36″ x 42″ to 56″ x 72″. Bulletin 123. * Reg. U.S. Pat. Off.

PRODUCTION RECORDS





Apron Feeder—Use where sifting through is undesirable. Overlapping, steel plates are of heaviest proportions. Built in widths from 30″ to 84″ and any length. Bulletin 114.

feed to attain unequalled production. Pick the Crushers and Feeders best suited to your operations from this Traylor group and write for the illustrated Bulletins you want today.

TRAYLOR ENGINEERING & MANUFACTURING CO.
134 Mill Street, Allentown, Pa.
Sales Offices: New York, N. Y., Chicago, Ill., Los Angeles, Calif.
Canadian Mfr: Canadian Vickers, Ltd., Montreal, P.Q.

Curved Jaws

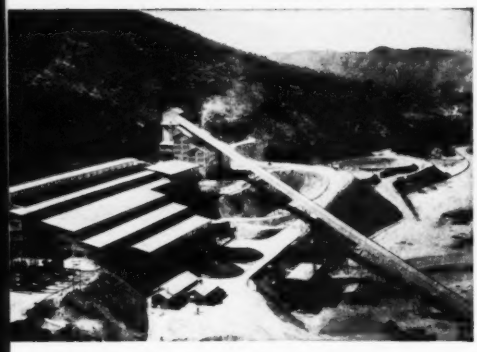
Crush More With Less Power

The curves of Traylor Jaw Plates apply more power as direct crushing force . . . eliminate lifting and churning. Non-choking design distributes wear more evenly over entire surface . . . makes them produce more each day and last up to three times as long.

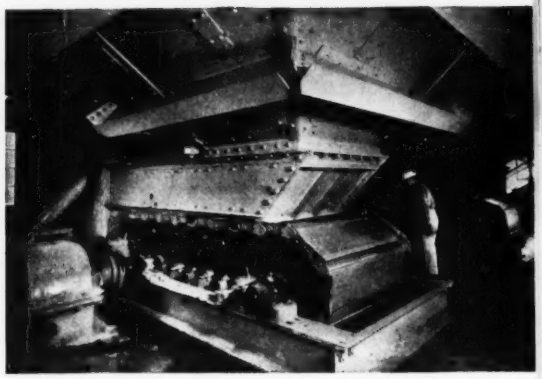
TRAYLOR

Jaw Crushers and Feeders
Reduction and Gyratory Crushers · Kilns
Coolers · Dryers · Grinding Mills

4 Angles on Reducing Costs per Ton in Ore Handling

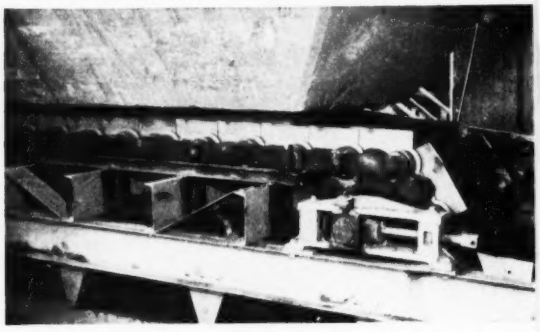


COPPER MINE solves problem with several S-A belt conveyors and an AMSCO manganese steel pan feeder. Head and tail shaft drives on one conveyor are fitted with S-A heavy-duty, roller type holdbacks to prevent belt from reversing under load in case of power failure. "Sacon" carriers are equipped with double Timken bearings. 1,200-foot belt has handled more than 15 million tons of ore up a 197-foot record lift.



LOWEST MAINTENANCE—Economical handling of over 5 million tons of ore in seven years was made possible by AMSCO manganese steel pan feeders. Durable, extremely tough manganese steel construction, combined with carefully engineered design, makes this S-A AMSCO feeder the best equipment available for this kind of heavy work. Feeders handle crushed ore from 500-ton capacity surge bin to two double-deck screens. Write for full information on how to handle large volume at lowest cost with S-A equipment.

CONTINUOUS, LOW-COST HANDLING is made possible by this S-A Belt Conveyor. On 48-inch belt a steady flow of crushed copper ore travels 1135 feet, with a lift of 190 feet, at the rate of 450 feet per minute. Tandem drives are located at head and tail ends. Heavy-duty S-A Holdback Units prevent reversal under load in case of power failure. Belt carriers are S-A "SACON" type, with double Timken roller bearings. Write today for latest data on S-A Belt Conveyors.

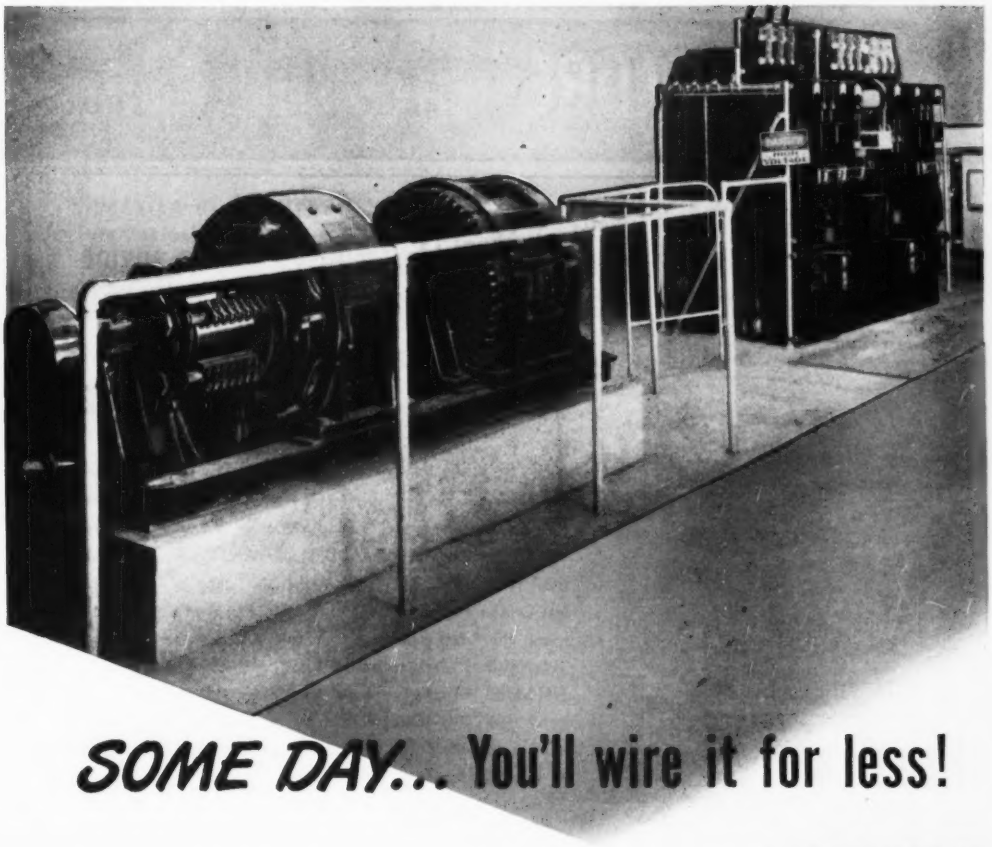


7,000,000 TONS OF WET IRON ORE have been handled at this mine by S-A equipment since 1923. Shown is one of two 36-inch x 14-foot S-A Pan Conveyors that feed ore from concrete bins into drier tubes. Other S-A equipment in mine includes a giant cast-steel pan feeder, a chain grizzly and several belt conveyors. If such low-cost handling through long years of continuous service is of interest to you, talk your problems over with S-A engineers.

STEPHEN S-A DAMSON
MFG. CO.

4 RIDGEWAY AVENUE, AURORA, ILLINOIS — LOS ANGELES, CALIF. ★ BELLEVILLE, ONT.

Designers and Manufacturers of All Types of
BULK MATERIAL HANDLING EQUIPMENT



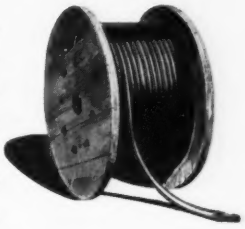
SOME DAY... You'll wire it for less!

Not for just a little less. The savings you'll realize when you wire with aluminum can run into thousands of dollars on a single job—and often deliver more power.

You'll find aluminum's lighter weight giving you easier, faster installation, lower cable cost—adding up to lower over-all job costs. The bigger the cable, the greater the saving when you *figure it in aluminum.*

Alcoa makes light, strong, conductive E.C.* Aluminum; leading wire and cable manufacturers draw, strand, and insulate it, and sell it under their own trade marks. Ask your wire supplier about it, or write ALUMINUM COMPANY OF AMERICA, 1476 Gulf Bldg., Pittsburgh 19, Pa.

The BIG DIFFERENCE is in your COSTS!

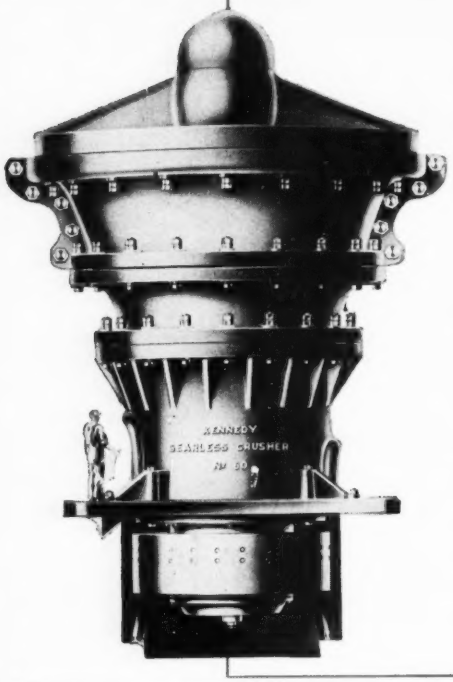


*E.C.: *Electrical Conductor* Aluminum

ALCOA EC ALUMINUM

FOR ELECTRIC WIRE AND CABLE

KVS gets MORE CRUSHING – from



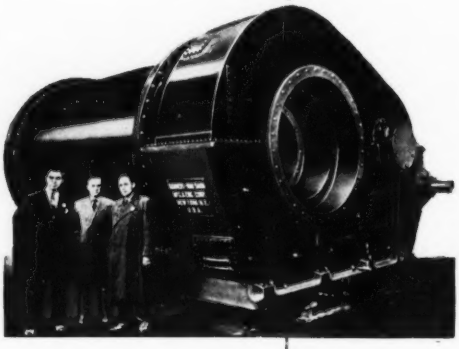
He put a big "pulley" on his engine to create added KINETIC ENERGY We do the same in the "KVS" GEARLESS!

Years ago Mr. Corliss had a great idea! He put a big pulley on his engine. The pulley whirled around, creating KINETIC energy, which added power to the steam engine. The same way, you get ADDED POWER IN A CRUSHER FOR NO ADDED COST when the big pulley in KVS Gearless Crushers whirls at a speed of 3,500 ft. per minute. What's more, the 8-ton pulley (as used in a KVS Crusher weighing 400,000 lbs.) whirls so easily it can be turned WITH TWO FINGERS! That's because there are NO power-eating noisy gears. If there were a bevel gear between the eccentric and the pulley, it would take six men with crowbars to turn it. In short, more CRUSHING for LESS POWER COST, is the big KVS idea.

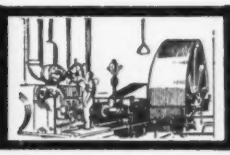
To get more grinding from less power, we carry "KVS" trunnions on OIL in our big TUBE and BALL MILLS

Yes, Sir, the "KVS" trunnions on large sized tube and ball mills are carried on oil. That means that the bearing never wears out, uses little power. All gears and bearings are automatically sprayed with oil before the tube mill is started (Design patented). In 15 years no "KVS" gears or pinions have worn out on this type mill.

Also, the Kennedy INTEGRAL GEAR DRIVE enables motor to be DIRECT CONNECTED to driving shaft of this KVS Ball or Tube Mill. Shaft is carried in roller bearings that CANNOT be misaligned or set wrong. This is a sure safeguard against wasted power.



NO WONDER USERS SAY—"KVS PRODUCTS ARE

LESS POWER-the  "CORLISS" Way

Speaking of CRUSHING . . . .

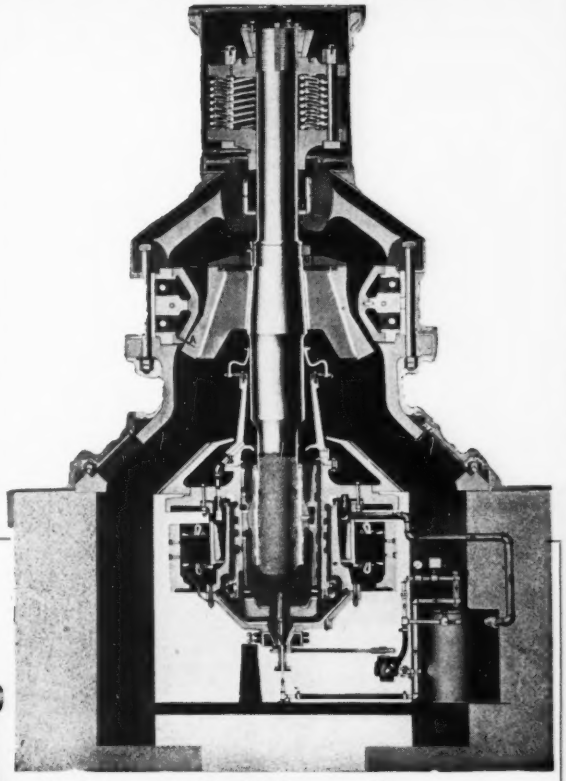
LOCATION: NATIONALLY KNOWN MINING CO.
NEW YORK STATE
CRUSHERS: FOUR NO. 37½ KENNEDY TYPE "S"
ROLLER BEARING GYRATORY CRUSHERS
FEED OPENING: 6¼"; **DIAMETER OF HEAD:** 3 FEET
DISCHARGE SETTING: 7/32" CLOSED SIDE AT HEAD
CAPACITY EACH CRUSHER:
56 TONS PER HOUR
HORSEPOWER EACH CRUSHER: 48 HP.
CLOSED CIRCUIT OPERATION

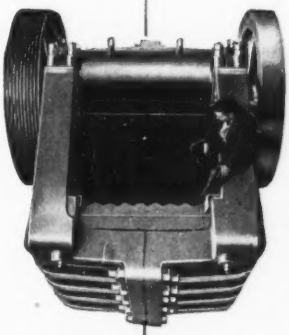
GRADATION AS FOLLOWS:

THE FIGURES!

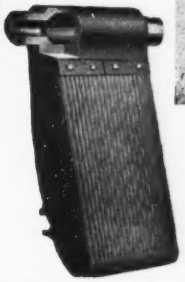
99.8%	Minus	3	MESH
93.3	"	4	"
80.6	"	6	"
66.6	"	8	"
56.1	"	10	"
48.1	"	14	"
40.6	"	20	"

Can You Equal These Figures?



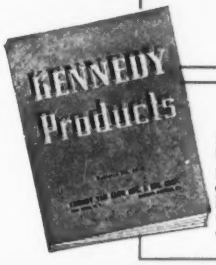


"KVS" SWING JAW



And to get BETTER crushing BOTH jaws share the load!

You get BETTER CRUSHING in the KVS Swing Jaw Crusher—because the angle of both swing jaw and stationary jaw is the same. Stationary jaw carries fully 50% of the load—result, you need LESS POWER to keep the swing jaw swinging and crushing. Another KVS idea . . . the swing jaw is all one piece, except renewable crushing plate. Also swing and stationary jaws are interchangeable, both the same length, and reversible end-for-end giving two wears.



Write

For this "KVS" Bulletin. It gives complete technical data on "KVS" CRUSHERS—the facts you want before you invest good money.

Kennedy-Van Saun
MANUFACTURING AND ENGINEERING CORPORATION
2 PARK AVE., NEW YORK 16, N. Y.
FACTORIES:
DANVILLE, PA., U.S.A.
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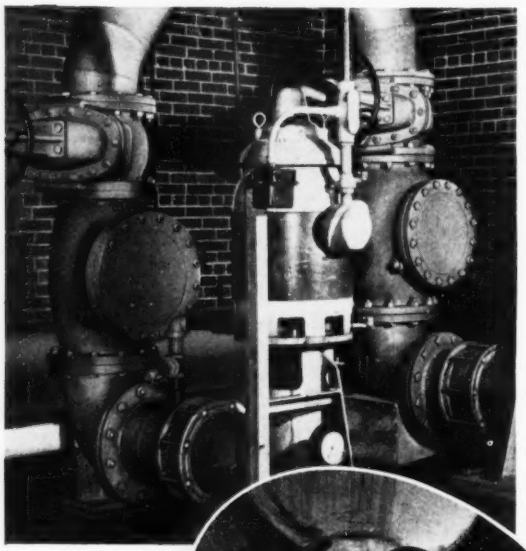
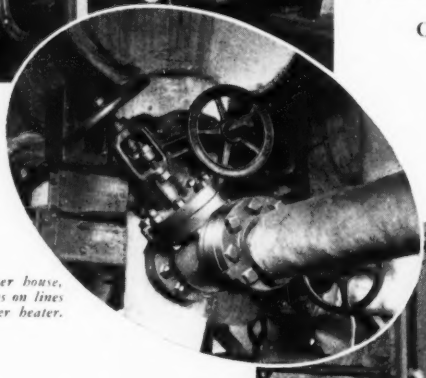
THE PRODUCTS WITH THE TROUBLES LEFT OUT"

For complete selection in mine piping ..."Get it from CRANE"

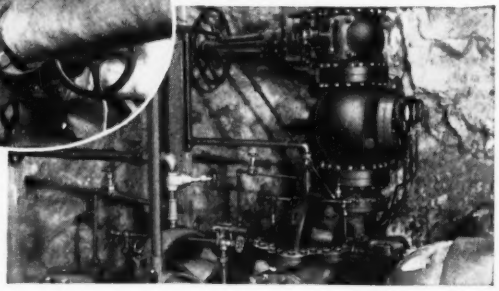
ONE SOURCE OF SUPPLY
RESPONSIBILITY
STANDARD OF QUALITY



CRANE *Iron Body Gate and Check Valves on mine pumping installation.*



IN COPPER MINE *power house, Crane Steel Gate Valves on lines to closed feed hot water heater.*



IN A SILVER MINE, *Crane equipment includes 12-in. Ferrosteel Gate and Check Valves. Also brass, globes, angles and checks.*

There is no easier, no more certain way to get the piping you need for power, process or general service mine installations. One order to Crane—through conveniently located Branches and Wholesalers—brings you the world's most complete selection of valves, fittings, pipe and accessories. One catalog gives you an unequaled choice of the best in brass, iron, steel and alloy materials.

Why not do as many leading mines have done and standardize on Crane? It is **One Source of Supply** broad enough to simplify all piping procedures, from design to erection to maintenance. **Undivided Responsibility** for materials helps you get better installations, avoids needless delays on the job. And for the **Highest Quality** in every item that makes for dependable piping performance—get it from Crane.

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USERS WRITE THE BEST ADS

"SIMPLICITY OF HOOKUP AND ECONOMICAL AND STEADY POWER MAKE THE D13000 'CATERPILLAR' DIESEL ELECTRIC SET IDEAL FOR MY MINING SETUP"

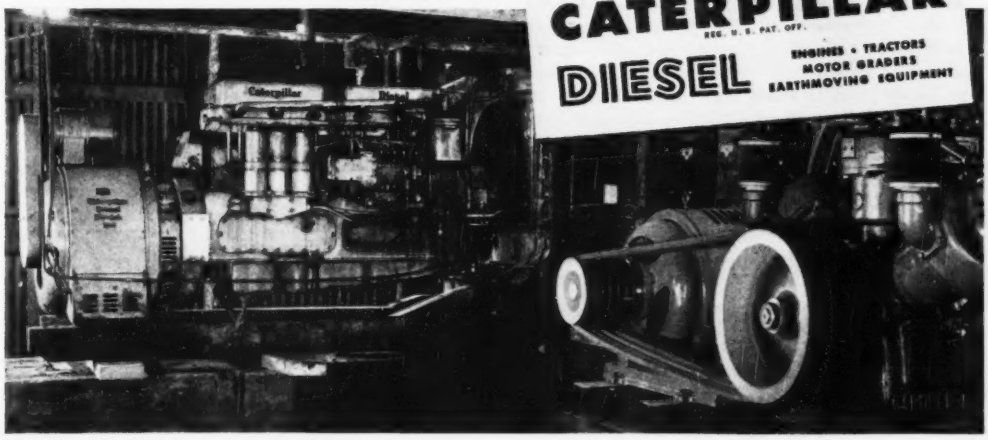
MR. R. M. MOORE, IDAHO SPRINGS, COLORADO

At six thousand feet elevation, some eighteen miles east of Idaho Springs, a D13000 "Caterpillar" Diesel Electric Set shoulders its share of the gold and silver mining operation in the Moore Mine. With the trouble-free, low-cost performance that's typical of "Caterpillar" Diesels, it runs 16 hours daily, 26 days a month, furnishing steady power for a 60-hp. motor on the air compressor, for a 20-hp. motor on the hoist and for all the lights.

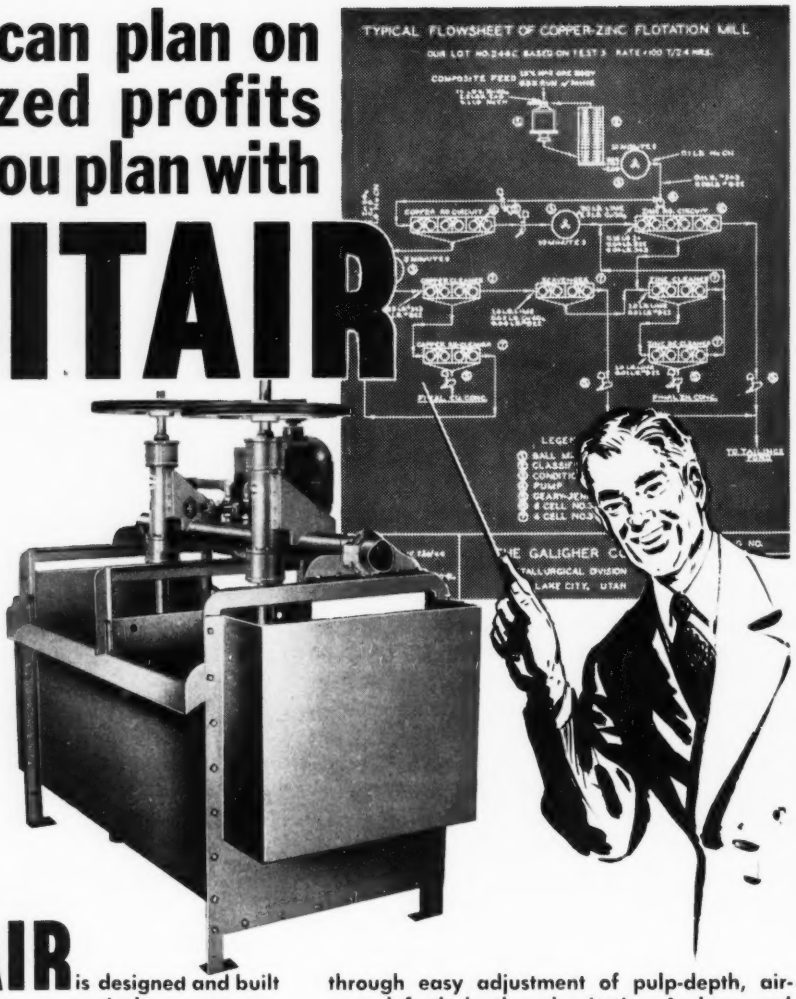
To date this D13000 has logged more than 13,000 hours of operating time on its hour meter, and it has a life expectancy of many more hours. That's because years of dependable service are built into all "Caterpillar" Diesel Engines and Electric Sets. They're coming off the assembly line in sufficient numbers now to assure prompt delivery. Your "Caterpillar" dealer is as close as your phone—call him for information about them today!

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

• On the job at the Moore Mine, near Idaho Springs, Colorado, a D13000 "Caterpillar" Diesel Electric Set provides the steady, low-cost power necessary for profitable mining. The price of a D13000 Diesel Electric Set (110-volt, 3-phase, 60-cycle, self-regulated) is $7475, F.O.B. Peoria. Price subject to change without notice.



You can plan on stabilized profits when you plan with AGITAIR



AGITAIR is designed and built to give you low-cost, economical ore recovery. Its highly efficient principle of operation is adapted by skilled metallurgical consultants and engineers to meet each individual concentration problem. And Agitair — being a highly flexible machine — stays fitted to the job in steady and dependable day-by-day operation. Its accurate regulation is quickly accomplished through easy adjustment of pulp-depth, air-control, froth-depth and agitation. And to round out your plan of stabilized profits, Agitair further saves you money through reduced power consumption, reagent savings and low maintenance costs.

* * * *

Write for detailed information on Agitair flotation applied to meet your special requirement.

"Leaders in Experience & Service"

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P&H PROVIDES THE PROOF

P&H Model 1400 Electric Excavator at The Steep Rock Iron Mines in Ontario, Canada.

The second P&H Electric Shovel was on the job at Steep Rock within less than a year.

—IN ONE LOCATION AFTER ANOTHER

Why are more and more large operators reordering P&H Electric Shovels? The reason is clear — lower operating costs. They've piled up the proof with Added Values like these:

1. *"Magnetorque"*Drive*— hoists the dipper with electro-magnetic power — lowers with less than half the usual inertia to overcome. It's faster.
2. *"Magnetron" Control*—entirely eliminates control fingers and contactors. It's simpler, more dependable.
3. *Independent Propel*—eliminates sliding gears, brakes, clutches and their controls — provides faster move-up.
4. *Air-filtered cab*—pressurized to allow only clean, fresh air to enter — no dust to damage electrical equipment.

Yes, proof on the job makes P&H the choice of discriminating buyers — leads to one repeat order after another. Investigate before you invest.

* T. M. of the Harnischfeger Corporation for Electro-Magnetic Type Clutch

ELECTRIC SHOVELS
4454 West National Avenue
Milwaukee 14, Wisconsin

HARNISCHFEGER CORPORATION
EXCAVATORS · ELECTRIC CRANES · ARC WELDERS · P&H · HOISTS · WELDING ELECTRODES · MOTORS

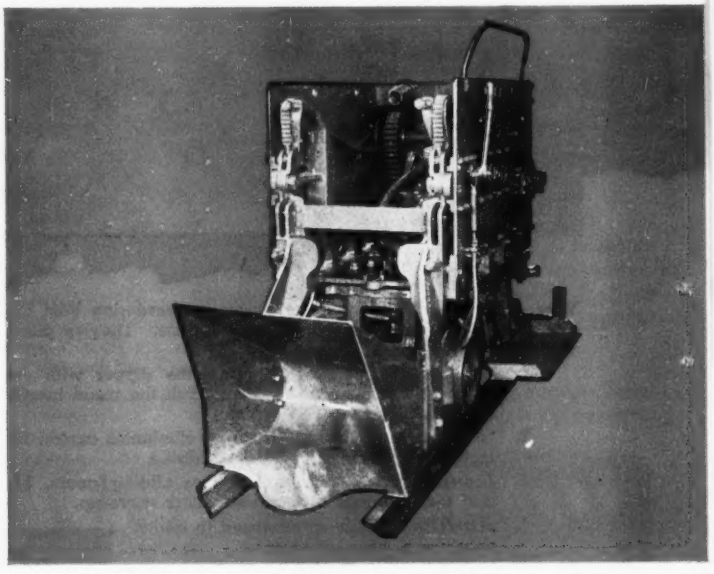
Every third P&H Electric Shovel sold is a repeat order

LEADING THE FIELD IN ELECTRIC SHOVEL DEVELOPMENT

"One of the best pieces of equipment on the job!"

That's what users say about

JOY SHOVEL LOADERS



The JOY HL-20 Shovel Loader for large drifts. Can load up to 3 tons per minute using cars from 50 to 90 cu. feet capacity.

The JOY HL-3 Shovel Loader for small drifts. Can load up to 2 tons per minute.

Note these Superior Features

They mean Lower Maintenance—Faster Loading at Less Cost—Greater Flexibility

- automatic CENTERING DEVICE, an exclusive JOY feature. Quickly and easily adjusted to have centering take place at any point in the loading cycle. Makes loading under inclined walls easier, and gives a longer, straight throw back into the car.
- SUPERIOR CONSTRUCTION . . . truck frame, gear case, and bumper are all combined in one heavy alloy casting for perfect alignment of all parts.
- exclusive "PISTONAIR" MOTORS . . . give greater power for loading and tramming, and provide better air economy.
- a LUBRICATION SYSTEM that is simple, yet provides ample lubrication for all moving parts.
- adjustable ROCKER-ARM LEVERAGE, another exclusive JOY feature. By changing position of lifting chains, the loader can load either long or short cars by changing discharge speed of bucket.

Consult a Joy Engineer

WRITE FOR BULLETIN

W&D M2093

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

He'll help you avoid crushed rope

IWRC

An independent wire rope core gives added support to the strands which lie around it.

In many types of wire-rope service, heavy pressures on the rope itself are unavoidable. The Bethlehem man knows, for instance, that even with the best of spooling, a fiber-cored wire rope is sometimes crushed on the drum. Often, too, loads are so heavy that great pressures exist as the rope passes around sheaves. These pressures frequently have a distorting effect on the wire structure of the rope.

When such conditions exist, the Bethlehem field engineer can usually spot them. Then he'll generally recommend rope with an IWRC (independent wire rope core). The IWRC is made entirely of steel wires and takes the place of the usual fiber core. Being all-steel, it naturally gives better support to the strands of the rope proper. Thus, to a large extent, heavy outer pressures are counteracted; the chances of crushing or distorting the rope are greatly reduced.

It's a good idea to have the Bethlehem field man look over your equipment, to see whether you need rope with IWRC. He will recommend it only where needed. In many cases, IWRC lowers costs substantially by greatly prolonging rope life.

Any time the Bethlehem man can help you—with this or other wire-rope problems—ask him to pay you a visit. He's always glad to, and there is never any charge for his services, no matter how much time he spends with you.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM WIRE ROPE
BETHLEHEM STEEL

When you think WIRE ROPE . . . think BETHLEHEM

Meet us at the 1949 Coal Show in Cleveland, May 9-12. Booth A-434

The Thermoid Impregnation Process insures a deeper penetration of rubber between the threads of the yarn, which encases each individual strand with protective rubber. The rubber acts as a sheath between the strands and prevents the destructive abrasion action as the product is flexed in use. To obtain the required rubber penetration, the twist of the yarn must be to exact specifications. With the yarn twisted too tightly, proper penetration of the rubber compound is impossible. This condition produces abrasion, causing premature failure. On the other hand, if the yarn is twisted too loosely, the product lacks tensile strength. Thermoid has discovered the optimum twist of the yarn which assures maximum rubber penetration and greatest strength. The development of Thermoid Impregnation Process is another step forward in Thermoid's planned program of product improvement, assuring maximum service and lower operating costs to industry through the use of Thermoid Industrial Rubber Products.

Thermoid Impregnation Process Assures Longer Hose Life

In mining operations where the going is tough and hose hazards such as sharp heavy rocks, abrasion, heat, moisture and acidity are encountered, you can safely specify Thermoid hose. *Thermoid makes a complete line of quality hose . . . specially built to meet every demand of mining service.*

If you use hose for handling air, water, steam or oil . . . there is a Thermoid hose "*built for the job*" . . . each designed for highest operating efficiency.

For quick service call the nearest Thermoid distributor. Thermoid sales engineers are available for advice on special problems.

It will pay you to ***Specify*** Thermoid!

Thermoid Quality Products: Transmission Belting • F.H.P. and Multiple V-Belts • Conveyor Belting • Elevator Belting • Wrapped and Molded Hose • Molded Products • Industrial Brake Linings and Friction Materials.

Thermoid Company

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Bear Brand Xanthates

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Z-4 SODIUM ETHYL

Z-5 POTASSIUM AMYL

Z-6 POTASSIUM PENTASOL AMYL

Z-8 POTASSIUM SEC. BUTYL

Z-9 POTASSIUM ISOPROPYL

This series of fine collectors is continually being developed and expanded to meet the problems of ore concentration throughout the world. We invite your inquiries concerning flotation concentration.

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THE DOW CHEMICAL COMPANY

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PIONEER PRODUCERS OF XANTHATES FOR METALLURGICAL USE

TRY US FIRST

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REMEMBER, when you use U·S·S COR-TEN or U·S·S MAN-TEN, instead of carbon steel, your steel supply will go one-third farther. Our warehouses from coast-to-coast will do their best to supply your needs in any of these four High Strength Steels—"The steels that do more." Phone, wire or write the warehouse or sales office nearest you.

U·S·S COR-TEN — A steel that has a yield point 1½ times that of structural carbon steel . . . that has greater impact strength and abrasion resistance . . . and whose resistance to atmospheric corrosion is 4 to 6 times higher.

U·S·S MAN-TEN—A steel that has twice the atmospheric corrosion resistance of plain carbon steel. Tough . . . high strength . . . hard-wearing and highly resistant to shock and vibration.

U·S·S ABRASION-RESISTING—Fills need for a low-cost, abrasion-resistant steel. Costs little more than plain carbon steel. In certain applications wears as well—sometimes better—than higher priced alloys.

U·S·S MANGANESE-NICKEL-COPPER — Affords weight reduction through high strength, greater toughness and improved characteristics in applications involving cold forming, metal arc welding and moderately severe impacts in low temperature service.

Fill in and mail the coupon NOW for free booklets on U·S·S High Strength Steels.

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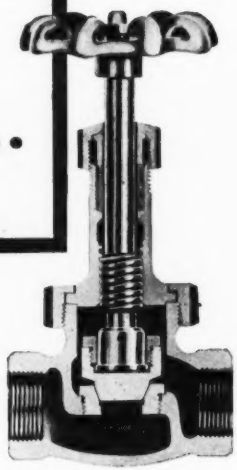
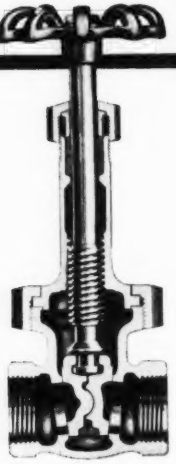
UNITED STATES STEEL

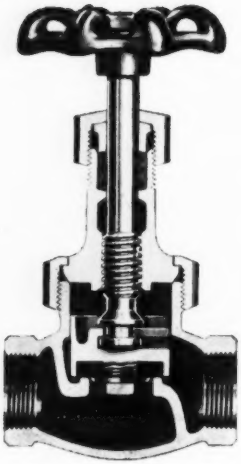
Walworth bronze valves...



Walworth No. 225P Globe Valve
500 Brinell Seat and Disc



Walworth
No. 29 Gate Valve



Walworth No. 95 Globe Valve
Re-New-Disc

built to give dependable trouble-free service on all recommended jobs

Walworth No. 95 Bronze Globe Valves (Angle Type: No. 96) are recommended for service where throttling is not required. They are rated at 150 psi working steam pressure, 500F; 300 psi cold water, oil or gas. The improved renewable disc and lock-on, slip-off disc holder — an original Walworth development—saves time and trouble. This valve can be repacked under pressure when fully opened. All parts are designed to give maximum service and strength.

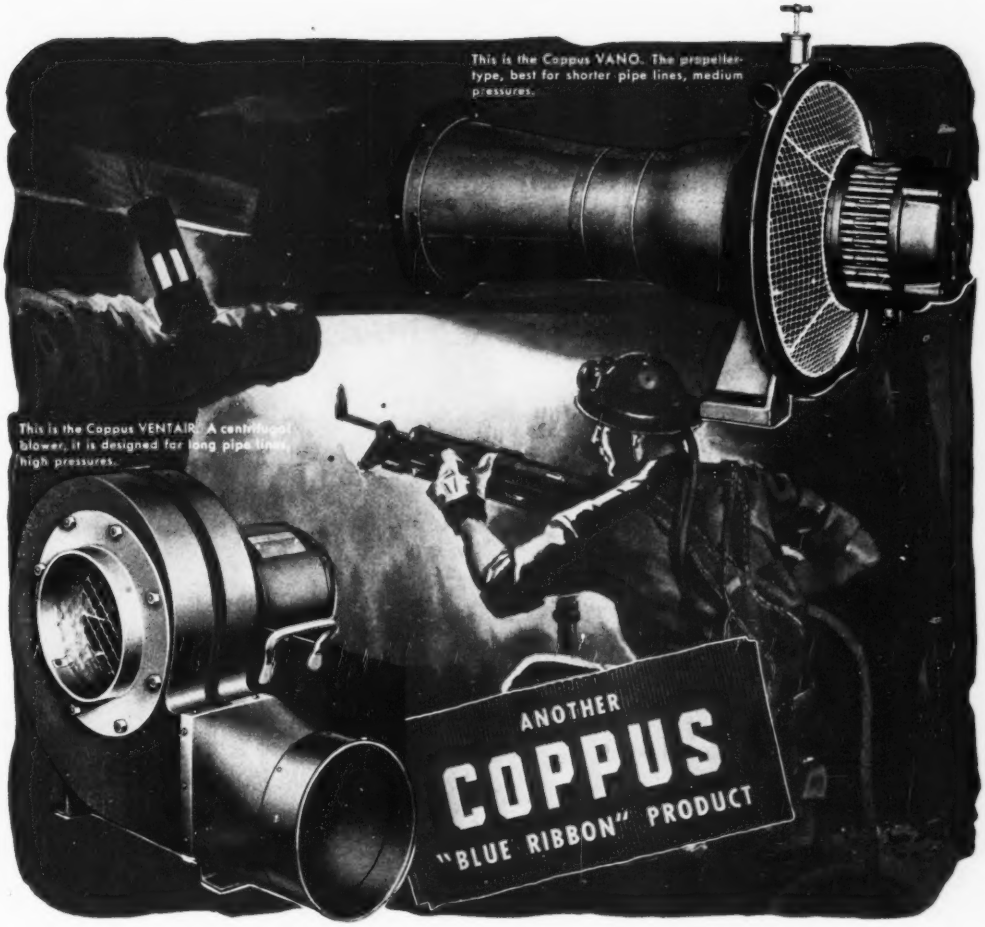
Walworth No. 29 Bronze Gate Valves are rated at 200 psi working steam pressure, 550F; 400 psi cold water, oil and gas. These valves have rising stems and integral seats. Sizes 2-inch and smaller have union bonnets; sizes 2½ and 3-inch have bolted bonnets. Valves up to and including ¾-inch have solid wedge discs; 1-inch and larger have split wedge discs. These valves can be repacked under pressure when fully opened.

Walworth No. 225P Bronze Globe Valves (Angle Type: No. 227P) are rated at 350 psi working steam pressure, 550F; and 1000 psi non-shock service on cold water, oil and gas. The stainless steel, plug type seat and disc — heat treated to 500 Brinell — can be closed on sand, slag, scale and similar floatage, without injury to the seating surfaces. They are the longest wearing, TOUGHEST bronze valves you can buy.

For full information about Walworth Quality Bronze Valves, see your Walworth distributor, or write:

WALWORTH
valves and fittings
60 EAST 42nd STREET NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD


This is the Coppus VANO. The propeller-type, best for shorter pipe lines, medium pressures.
This is the Coppus VENTAIR. A centrifugal blower, it is designed for long pipe lines, high pressures.
ANOTHER
COPPUS
"BLUE RIBBON" PRODUCT

When you buy air... one of these two blowers will give you much more for your money

When buying mine ventilation equipment, you're buying *air*, so the question to ask is: "How much air can I get from a definite amount of power?" The answer is: "30% to 100% more by using Coppus VENTAIR or VANO Blower."

Both Coppus types are designed expressly for mine service and give the same high performance under different conditions. Coppus VENTAIR is a centrifugal blower for high pressures, long pipe lines. Coppus VANO is a propeller-type, for medium pressures and shorter lines. Using the right type for your conditions you can get more air from a Coppus blower than from any ordinary all-purpose fan.

Both can be used as exhausters . . . electric motor or compressed air driven . . . in capacities up to 90,000 cfm. *Only Coppus makes both types* — and only Coppus products bear the "Blue Ribbon" that is your assurance of unfailing dependability.

COPPUS ENGINEERING CORPORATION
284 Park Avenue, Worcester 2, Mass.

Please send..... Bulletin 130

Name.....

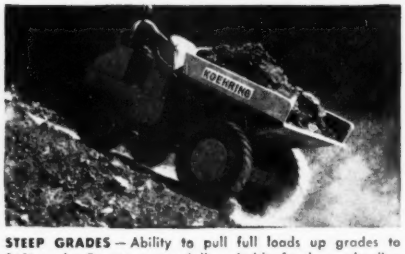
Company.....

Address.....

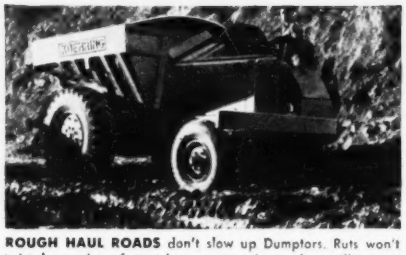
FOR

Bigger Output

IN ONE SECOND, Koehring Dumpster dumps full load into feeder. No unproductive waiting for "slow" body hoist to work — greater dumps load fast and clear in one second.



STEEP GRADES — Ability to pull full loads up grades to 24% make Dumptors especially suitable for heavy hauling out of pits. Sturdy hydraulic brakes give complete control on steep down-hill runs. Parking brake is independent.



ROUGH HAUL ROADS don't slow up Dumptors. Ruts won't twist heavy-duty frame because steering axle oscillates as much as 21°, takes the strains out of rough mine road travel. Big tires help cushion shocks, give better traction, flotation.

KOEHRING HEAVY DUTY

in mines, pits and quarries
KOEHRING DUMPTORS
load FASTER • haul FASTER • dump FASTER

ON typical, rough, off-road hauls, you can increase trips per hour, yardage per day and reduce maintenance problems with Koehring heavy-duty, 6-yard Dumptors. Here's why:

Short Turning Radius, Big Target SAVE SPOT AND LOAD TIME

Short, 19'6" turning radius and compact design let Dumptor get close in under shovel . . . save jockeying back and forth. Big, 64 square-foot body opening provides an easy-to-hit target. Result — increased shovel production, more haul-time, less spot and load time.

Heavy-Duty 6-Yard Body BUILT FOR HEAVY ROCK SERVICE

To take severest shocks of shovel-loading, all-welded Dumptor bodies are heavily ribbed with 4" channels. Bottom of seasoned 1-5/8" oak timbers, between two 5/16" steel plates, cushions load shocks. In heavy mine and quarry service, Dumptors give you less down-time, more work-time, year in, year out with less maintenance care.

Ton of Strength per Ton of Payload SPEEDS TRAVEL ON ROUGH HAULS

Koehring Dumptors have rugged 8" ship channel main frame, heavily trussed . . . 4" chrome steel drive axles . . . cast alloy-steel "I" beam steering axle, that take the twists and strains of fast off-road travel. Big rugged tires take road shocks. There are no leaf springs . . . Dumptor needs only one big double-coil spring, on steering axle. You have NO spring maintenance.

6 HP for Every Ton of Gross Weight GIVES GREATER GRADE-ABILITY

Dumptor has 6 HP for every ton of gross vehicle weight. That means more "GO," more acceleration, less shifting on grades. Also, plenty of power to climb grades to 24% with full load. Dumptors are built to stand up under the toughest hauling of mine and quarry service.

No Slow, Troublesome Body Hoists . . . DUMPTOR DUMPS IN ONE SECOND

At the dump, gravity dumps load . . . *fast*. One second and body is empty . . . you're on the way for another load. You save 15 to 25 seconds every dump. No mechanical complications . . . no body hoist maintenance. Free-swinging kick-out pan breaks suction of sticky materials . . . adds 3/16" of steel to strength of Dumptor bottom.

No-Turn Shuttle Operation SAVES SLOW TURNS EVERY TRIP

Because Koehring constant-mesh transmission makes same 3 speeds available in both directions, Dumptors are never turned on shuttle hauls. On a 1,000' haul (16 round trips per hour), this gains 8 minutes every hour.

Let your Koehring distributor show you what Dumptors can do to save money in your mine, pit or quarry.

Koehring 605 Rock Shovel Keeps Pace with Fast Dumptor Hauling Speed . . .

For balanced, high-production teamwork on both your excavating and hauling operations, team up your Dumptors with the Koehring heavy-duty 605 Rock Shovel. Its fast operating speeds . . . big 1½-yard dipper capacity . . . rugged, extra strong boom, with shock-absorber mount . . . and big, power-operated clutches, all keep production high, costs low. Your Koehring distributor also can show you heavy-duty Koehring excavators in ½-yard, ¾-yard, 2½-yard sizes to satisfy your exact requirements.

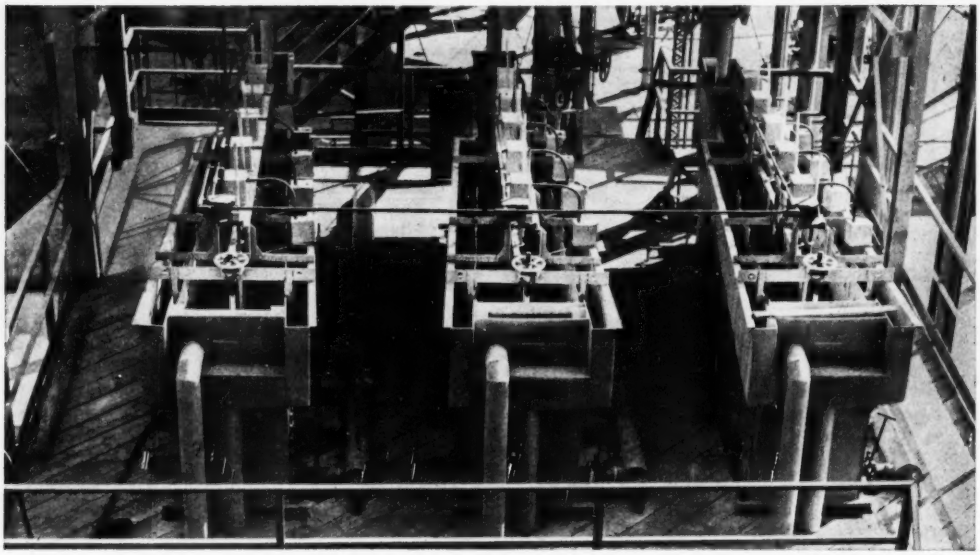
KOEHRING COMPANY, Milwaukee 10, Wisconsin

Subsidiaries: JOHNSON • KWIK-MIX • PARSONS

for ***accurate classification*** according to . . .

1 SIZE AND DENSITY

2 OR SIZE ONLY



THE DORRCO SIZER

Operating on the "hindered settling" principle, the Dorrco Sizer is a versatile hydraulic Classifier, which greatly magnifies the differences in settling rates between particles of varying sizes and specific gravities. Containing from 4 to 8 pockets, it is uniquely designed to grade any feed composed of particles ranging from 4 mesh to 200 mesh with extreme fines passing out in the overflow.

In ore dressing the Dorrco Sizer . . .

1 Produces the perfect feed for concentrating tables and spirals by collecting large particles of low specific gravity and smaller particles of higher specific gravity together in the same pocket.

2 Classifies according to particle size when handling a feed of mixed sizes but of the same specific gravity.

SIMPLE CONTROL

FULLY AUTOMATIC

ACCURATE SIZING

EASY CLEANOUT

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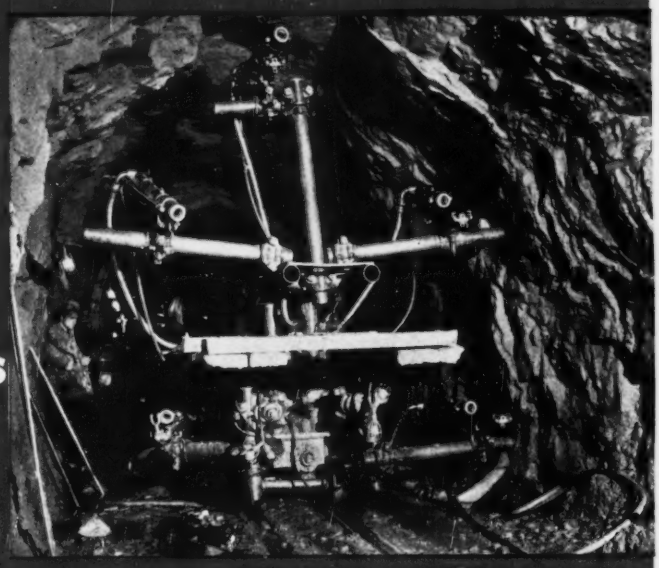

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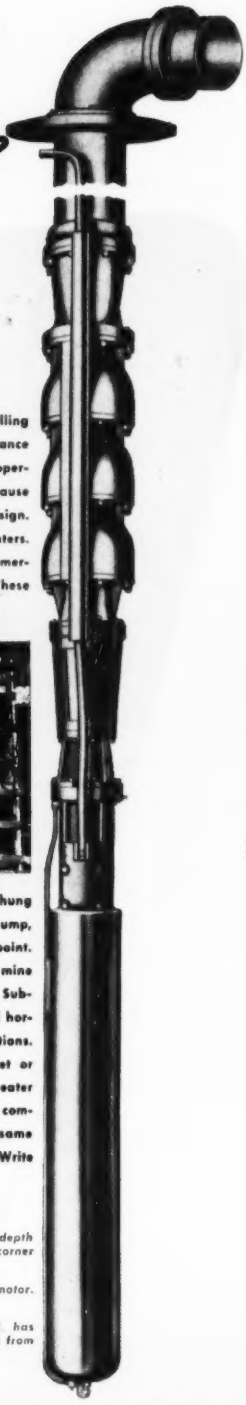

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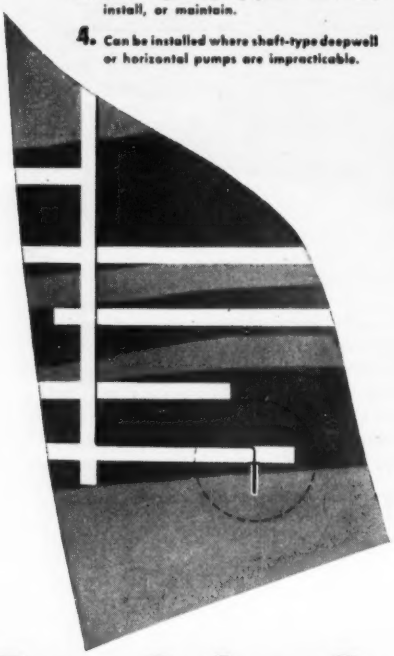

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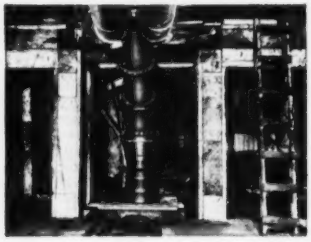

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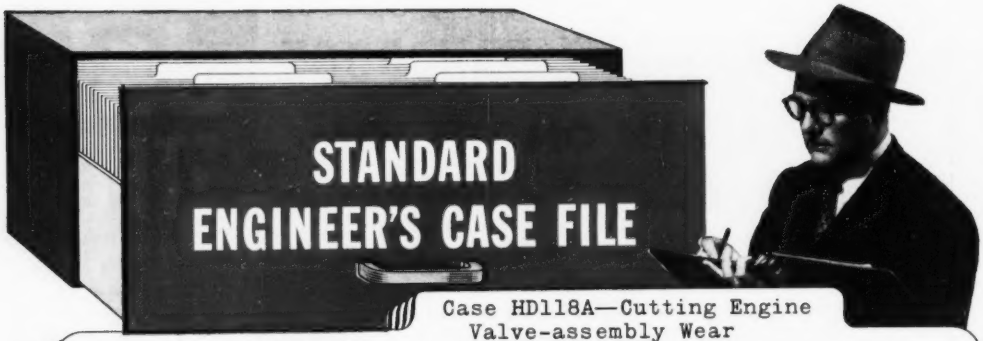
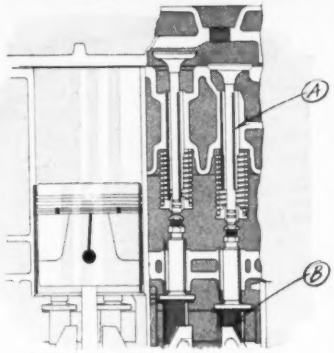


Case HD118A—Cutting Engine Valve-assembly Wear



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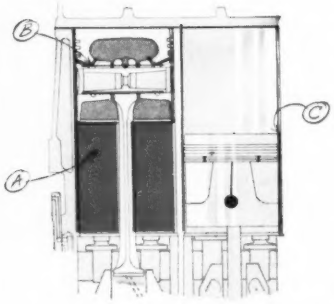

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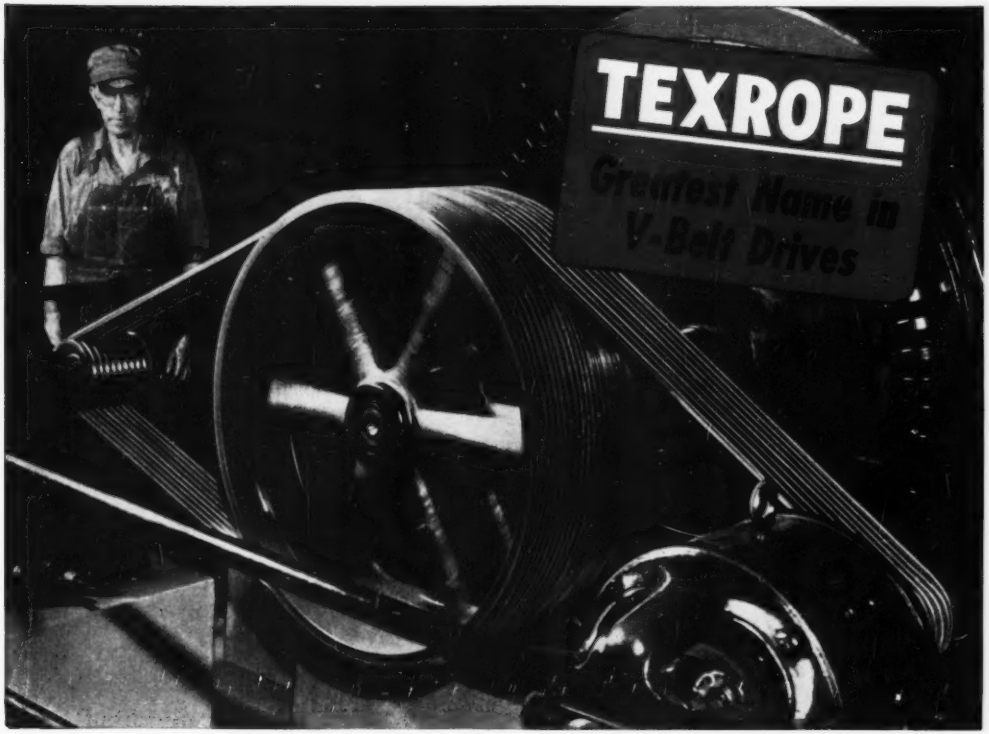

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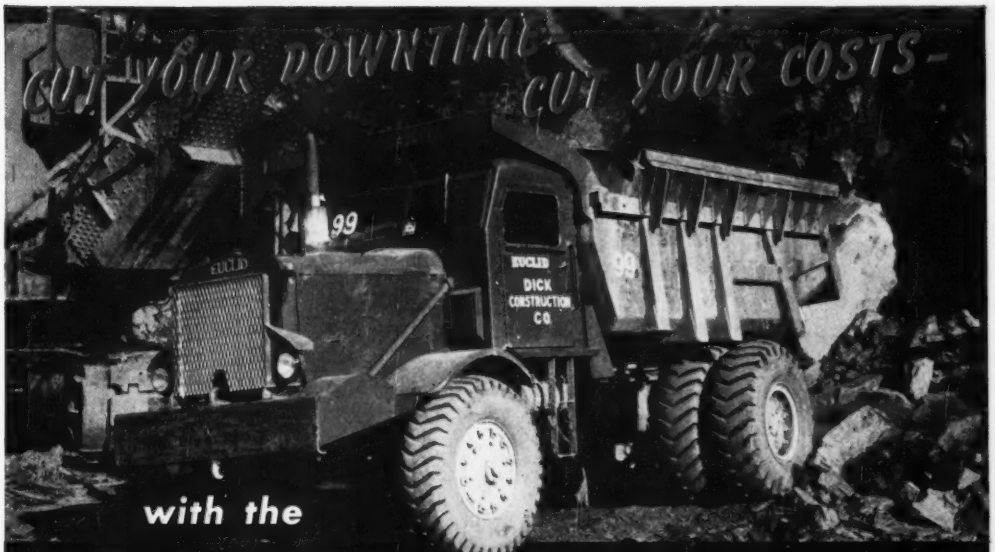

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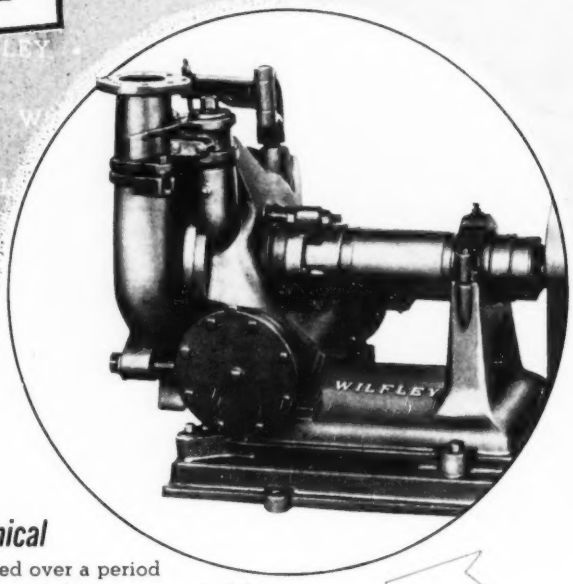

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The Election of November 2, 1948 GAVE NO MANDATE FOR SOCIALISM

The President and those who support his legislative program have objected to the substance of my previous editorial, which appeared under this headline: "Now is the Time to FIGHT SOCIALISM in Washington."

In that editorial I explained how Washington is poised to follow the disastrous policy of forcing industry to skimp on new plants and new equipment. That policy landed Britain in the numbing embrace of the Socialists. I cited the experience of Britain to show how such skimping on industrial tools can bring a nation to economic stagnation . . . and Socialism.

The President, in his recent Jackson Day speech, brushed aside this warning . . . "They are again trying to frighten the people with the old worn-out bugaboo that Socialism is taking over in Washington." Senator Francis J. Myers of Pennsylvania asserted that I was guilty of "warfare against any reasonable effort to keep our system of free enterprise working."

These criticisms may be sincere. But they are not well-founded.

I want to show why they are not well-founded by basing this editorial on Washington rather than Britain.

In Washington the Administration has proposed a legislative program, the key parts of which would clearly put the country far on the road to Socialism. Let us see how.

There are two steps in the process:

FIRST: The government by its taxation program undermines private industry so that it cannot provide itself with the necessary new plant and tools.

SECOND: The government itself steps in to provide the plants and equipment that it has blocked industry from getting. *That is Socialism.*

Here is how Washington is promoting Socialization of the steel industry—and of other industries.

Steel has been expanding its capacity and improving its equipment chiefly by plowing back its profits. During the last three years it has spent $1.4 billion for new plants and new tools. That was more than the companies had available from their own earnings. But profits provided more

continued on next page

than half of that money – more than $700 million. The remainder came from loans and from depreciation reserves set aside out of the earnings to replace worn-out equipment.

Profits must continue to provide the funds needed to pay for the bulk of the steel industry's necessary expansion. That is because private citizens, their income slashed by heavy taxes, have not been willing to buy steel stocks even at prices ruinously low for the companies and their present stockholders. The stock market currently prices the mills and other facilities of the nation's principal steel-producing companies at far less than fifty percent of the cost of reproducing them.

Let us take another example. Profits are essential to expansion in the electric light and power industry also. This year private companies are planning to buy $2 billion worth of new plant and equipment. To do that without going overboard in debt, they must sell to the public some $300 million worth of common stock. A squeeze on their profits would make that sale virtually impossible.

For tens of thousands of small business enterprises profits afford virtually the only practical source of funds for new equipment and expansion.

In the face of these and many other examples that might be cited, what is the most effective way to prevent industry from re-equipping itself and expanding is capacity to meet our essential needs?

Obviously, it is to cut down profits. And that is what the Administration is trying to do. The President has declared that steel prices are too high, and is demanding that Congress raise taxes sharply on all corporations.

There you have the first step toward socializing industry.

Next comes step two. Have the government supply the tools and equipment which, by taxation, it prevents industry from getting.

The Administration has proposed legislation to carry out this second step. It is called the "Economic Stability Act of 1949," for short, the "Spence Bill."

This bill gives the President the power to provide industrial facilities – in steel, power or any other industry – where he finds that a shortage is hampering or is likely to hamper the economy.

True, the bill says that the government is not to construct new plants if private companies will do it through government loans, on terms prescribed by the President. That may be just one step short of complete socialization. But it is only a short step. And the Spence Bill authorizes the government to take that step.

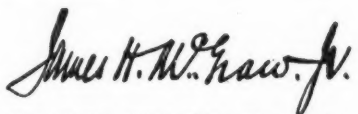
By itself, the Administration's "Stability Act" sounds harmless enough. It would have the government build plants only as a last resort. But it provides also that if private enterprise cannot turn out all the goods the country needs, the government can and should step in and provide the equipment to do it.

Now, take that power together with an Administration tax program that undercuts the ability of private enterprise to supply the new plants and equipment it needs out of its own earnings. That combination promotes government ownership and operation of industry.

And that is Socialism.

The American people, of course, have the right to live under any system they choose—Capitalism, Socialism, Fascism, Communism, or what-have-you. But before Socialism or any other "ism" is imposed upon us from above, the people should know the facts. If this editorial shall have contributed in some small degree to that end it will have served its purpose.

The election of November 2, 1948 gave no mandate for Socialism.



President, McGraw-Hill Publishing Company, Inc

ENGINEERING AND MINING JOURNAL

APRIL, 1949

Government—Servant or Master?

SLOWLY A TREND is growing in this country away from reliance on the strength and ability of the individual toward dependence on Government as the solution to all personal and industrial problems. More and more frequently people are turning to Government control, Government operation of utilities, Government price supports, Government subsidies, and Government assistance of all kinds. This trend must be controlled.

Certainly our Government can and should be the strongest possible bulwark to our way of life. Especially is this true as governments outside the United States drift farther and farther into planned and controlled economies of one kind or another. To survive in a collectivist world, our free enterprise system must have both our own and our Government's whole-hearted support. If this support is withheld, or given perfunctorily, we, too, may see our freedoms vanish quietly down the drain of some American form of stateism.

Undoubtedly we will need to modify our system to meet tomorrow's new conditions. We will certainly have to work more closely with Government than we ever have before, except in wartime. The problem will be to utilize most effectively Government's service and regulatory functions without giving in to Government control.

First, let us admit that progress implies and requires change, therefore we must avoid the instant and violent rejection of every idea that falls short of Simon-pure free enterprise. From here on, our system will be served best by an open mind and a willingness to work constructively, not by stubborn resistance to change.

This does not mean, of course, that we must embrace every idea that promises to achieve Utopia by the passage of a single law or the creation of a new bureau. For example, the Murray-Engle Bill (H. R. 976 and S. 240) proposes to stabilize the operation of marginal mines through the discretion of a single omnipotent administrator, who will fix, and grant them, a "fair profit" whatever their operating costs may be. Granted that under certain conditions of emergency some mines or mining districts may need Government help, do we have to establish a dictatorship to do it?

After all, the essence of free enterprise is the obligation to conduct one's business profitably. The profit motive, in brief, is the energizing spark. Douse that spark with a bureaucratic estimate of what constitutes a proper "operating margin" and the system is dead.

If we believed in the profit system, and if our Government believed in it, we would be working in concert with Government to keep that system running smoothly in the interests of all of us. We should be, but it is all too clear that a great many in industry and Government are not.

For example, our Federal income tax structure should be altered to encourage, rather than in effect to prohibit, the opening and development of new small mining enterprises. Our Government has gone part of the way in meeting mining's special tax problems. We can help it go all the way.

In fact, the Government needs help from the country's most competent and forward-looking citizens vastly more than it needs new legislation. The work of the Hoover Commission is, of course, the outstanding example of this sort of public service. The least each of us can do to help this work is to let Congress know his views on the reforms Mr. Hoover's group has recommended.

Actually, the Hoover Commission has only documented what was already broadly apparent; that the country badly needs a better administrative set-up and better men to run it.

We will not get better administrators overnight, nor will we get them by simply raising the pay of every Government job-holder. We can only get them by ourselves entering more actively into politics, and by seeking, not shunning, the service of our Government.

In the next few years perhaps, our American system will be stressed and wracked more severely than at any time in its history. To survive, the system must be flexible, and both Government and industry must work together as they once did in winning a war.

Let those of us in industry make sure that in the months ahead we do nothing to weaken our hold on freedom. But of vastly greater importance, let us make doubly sure that we do all possible to strengthen the free enterprise system in which we believe, and that we work vigorously in and with the Government that could be that system's strong defender at home and abroad.

WHERE DO COMMUNISTS PLACE THEIR LOYALTY?

Communist Leaders in Many Countries Give the Same Answer

IN THE UNITED STATES

William Z. Foster, chairman, and Eugene Dennis, general secretary, of the Communist Party, speaking of possible war between the United States and Russia—"We would oppose it as an unjust, aggressive, imperialist war. . . . We Communists (would) cooperate with all democratic forces to defeat the predatory war aims of American imperialism. . . ."

President Truman branded them as "traitors." Sen. Claude Pepper, of Florida, usually admired by the Communists, said that, whenever Congress declares war, "every citizen who does not support that course is disloyal."

Comment: The Communists themselves decide when a war is "imperialistic." Until Hitler invaded Russia in June, 1941, the Communists opposed the war as "imperialistic." When Russia became involved, they decided it had suddenly become a "People's war" and supported it.

IN FRANCE

Maurice Throez, top Communist—"If the Soviet army . . . should be brought to pursue the aggressors onto our soil, could the workers and the people of France have any other attitude toward the Soviet army than has been that of the peoples of Poland, Rumania and Yugoslavia?" (These are Communist nations.)

IN GREAT BRITAIN

Harry Pollitt, general secretary of the Communist Party, commenting on possible war between Britain and Russia—"We will . . . organize strikes and councils of action to prevent that war from being carried through."

IN ITALY

Palmiro Togliatti, Communist leader—"The Italian people cannot but condemn all aggressions and would have the evident duty of helping the Soviet army in the most effective way possible."

IN AUSTRIA

Volksstimme, Communist newspaper—"The Austrian people will support the Soviet Union in case of war."

Communists Still Threaten

JOSEPH M. GAMBATESE
Washington Bureau
McGraw-Hill Publishing Co.

A BURNING ISSUE in the congressional debate on a new labor law is whether to hang on to the non-Communist affidavit rule. If the 81st Congress keeps this part of the Taft-Hartley law, much of the credit should go to the producers and processors of non-ferrous metals who have backed the Government's policy by refusing to bargain with a Communist-dominated union.

Blame, if any, will have to be shared by the CIO Mine, Mill and Smelter Workers. Leaders of this union have refused to sign non-Communist affidavits which would entitle the union to use the facilities of the National Labor Relations Board. More important, however, the union stubbornly refuses to rid itself of the leadership which, to this day, rigidly adheres to the Communist Party line.

True, Mine-Mill doesn't stand alone in refusing to comply with the affidavit agreement. CIO President Philip Murray's steel workers and John L. Lewis' coal miners have not complied "on principle," but they cannot be accused of being under Communist influence. The noncomplying CIO electrical union is the largest CIO organization following the C. P. line, but the rank and file show signs of doing something about it.

Mine-Mill is unique in this respect: It is the only Communist-dominated union in a basic and vital industry whose membership is making no serious attempt to purge the Communist sympathizers.

When postwar attempts to take control from the Party-liners failed, the anti-Communist groups simply pulled out of Mine-Mill and affiliated with other unions. This strengthened the Communist clique in Mine-Mill, so that today the union is more solidly Communist-minded, but weaker as a trade union.

The problem of Communism in the metal mining industry is not a new story to readers of *Engineering and Mining Journal*. How Mine-Mill has followed every twist and turn in the Communist Party line since before the Hitler-Stalin pact was documented in the article "Communism Menaces the Mining Industry," in the issue of July, 1947. Last May we told you of the Government's policy on Communist-dominated unions and the ramifications of dealing with Mine-Mill. The article was entitled "Why Deal With a Union Influenced by Communists?"

We now have another chapter. It is in three parts. The first: A review of why one major employer in the industry—American Zinc, Lead & Smelting Co.—decided to have a showdown on the Communist issue and what happened when it did.

The second: How the Precision Castings Co., by standing firm, rid its plants of Mine-Mill.

The third: How Mine-Mill leaders continue to play the Communist game.

Operators Testify

The experiences of the American Zinc and Precision Castings companies were related by company officials at the recent Senate Labor Committee hearings on the Administration's Thomas Bill which would repeal the Taft-Hartley law and reenact the Wagner Act with minor "improvements."

The major part of their testimony dealt with reasons why the non-Communist affidavit, which the Thomas Bill would abandon, should be retained as part of the Government's labor policy. The American Zinc official, President Howard I. Young, also president of the Amer-

HOWARD I. YOUNG tells the Committee what happened when his company came to grips with the Communist issue.

WILLIAM B. DURING, vice president, Precision Castings Co., tells how they rid their plants of troublemakers.

Metal-Mine Labor Relations

ican Mining Congress, suggested that employers as well as union officials be required to sign non-Communist affidavits "to eliminate the complaint that labor is being discriminated against."

William J. During, vice president and general manager of Precision Castings, didn't go quite that far, although he said he personally would "gladly sign" such an affidavit.

The Zinc Company's Story

Here is the story of American Zinc as told to the Senate committee by Mr. Young:

The company normally employs 2,500 to 3,000 men at seven principal operating plants: Mines, a mill and an agricultural limestone plant near Knoxville, Tenn.; a mine and mill at Metaline Falls, Wash.; zinc smelters at Fairmont City, Ill., and Dumas, Texas; zinc oxide plants at Hillsboro, Ill., and Columbus, O., and an electrolytic zinc plant at Monsanto, Ill.

At one time, Mine-Mill locals represented the workers at all seven plants. In 1947 and 1948, the locals at Knoxville, Dumas and Monsanto seceded from Mine-Mill over the Communist issue. The other four plants were struck last summer because of the company's refusal to renew contracts with Mine-Mill until its officers signed non-Communist affidavits. American Zinc took this position because it was faced by an "intolerable situation" brought about or encouraged by Communists in the union.

At Columbus, the company agreed to recognize the AFL Chemical Workers in December when it was convinced, by the showing of membership cards, that the employees wished to be represented by the AFL union. But the Mine-Mill strike continued at this and the three other plants. The Metaline Falls strike began July 1. Those at Columbus, Fairmont and Hillsboro were delayed until Aug. 13.

Mr. Young detailed the experiences of the Fairmont City plant with Mine-Mill to illustrate "the difficulties which a company goes through when it has a Communist-controlled union in its plants."

The Fairmont plant was a large one and thus a fertile ground for troublemaking. Communists strive to interfere with stable relations and efficient operations, promote class warfare and encourage militancy. They stir up trouble, although most of the strikers are loyal Americans.

Relations with the union began deteriorating in 1940 when the international officers began to exert a dominating influence upon the local. The union committee felt that it had to be "militant" in encroaching on management operations. The general plan of demoralization included:

(1) Persistent efforts to keep the working force in constant turmoil by stirring up groundless grievances.

(2) Making numerous demands for wholly unreasonable rate adjustments, increase of working force on various jobs, and reduction of the work content on various jobs.

(3) Encouraging employees to refuse to carry out foremen's instructions.

(4) Advising employees to enforce their demands by persistent refusal to work unless their demands were acceded to, and threatening them with fines if they did not carry out the union instructions.

(5) Engaging in general slowdowns and deliberate loafing on the job.

(6) Engaging in work stoppages and strikes without justifiable cause.

(7) Ordering employees not to work overtime, even on emergency

repair jobs necessary to carry on plant operation; in one case, an employee was fined by the union because he volunteered to aid, while on his vacation, in protecting company property threatened by a flash flood.

(8) Reference to the company as the "common enemy" of the workers.

In the spring of 1948, American Zinc decided to face the issue. Why? Because non-Communist leaders had left the union, eliminating any hope that the membership would drive out the Communists; and because of a belief that, through the non-Communist affidavit provision, "Congress intended to help management rid its labor relations of the plague of Communist influence, as well as to protect the individual workers against Communist exploitation." The international situation was critical. It was time to "face the situation immediately." Notice was given in May at the four plants with Mine-Mill locals—Fairmont City, Hillsboro, Columbus and Metaline Falls—that the company would not bargain until the union complied with the law. The contracts expired June 30.

The company assured the employees it was not trying to break the union and would not alter wages and working conditions if the employees would continue to work without a contract until the affidavits were filed. To help explain its position, the company mailed each employee a 14-page document concerning Communism in Mine-Mill.

Metaline Falls struck July 1, the others Aug. 13. The strikes were marked by unusual violence and "goon" tactics.

At Four Plants

At Fairmont City: Until an injunction was obtained in the state court, union leaders refused to let supervisors enter the plant. So for the first four weeks plant supervisors lived inside the plant. Five pickets and the local were convicted of contempt of court in preventing the removal of 50 railroad cars from the plant. They were fined a total of $1,500. A union committee visited a Catholic priest to protest his anti-Communist sermons and warned him against encouraging strikers to return to work.

At Metaline Falls: A state court injunction was obtained to protect a small group which denounced the Communist leadership and continued to work. Despite the injunction, several employees were assaulted and abused in their own homes and dragged to the union hall. Six strikers faced trial in March on charges of assault, burglary and kidnaping.

At Columbus: The sheriff had to read the Ohio Riot Act to massed pickets who sought to prevent a group from returning to work. Despite an injunction obtained against mass picketing, considerable violence occurred, including the overturning of an automobile, physical assaults, and throwing bricks through windows in the homes of non-strikers. Five strikers got jail sentences for beating up the assistant plant superintendent, four others for contempt of court. Six shots were fired into the plant with workers inside just a week before Mr. Young testified before the Senate Committee.

At Hillsboro: Strikers who wanted to return to work were threatened. A foreman and his wife were attacked, returning home at night.

These are examples of "what it means to be forced to deal with a Communist-dominated union," Mr. Young told the Senate committee.

"If we are going to keep our industry in healthy shape, which is necessary to meet our national defense, as well as (keep) our national economy on the proper basis, it is a definite obligation for us to try to keep our labor group from under the influence of Communism."

Good Relations Elsewhere

Mr. Young said his company has signed union shop contracts and has "fine" labor relations in all plants except where there is Communist-minded leadership.

Communism, he feels, is the only cause of trouble in the industry.

Mr. Young's advice to Congress:

1. Unless you can devise an even more effective means of ridding the labor movement of Communism, retain and strengthen the anti-Communist affidavit provisions of Taft-Hartley.

2. To eliminate the complaint that labor is being discriminated against, it would be advisable to extend the rule to include employers.

(Mrs. Elizabeth Sasuly, legislative representative for Mine-Mill, filed with the Senate committee a statement by Reid Robinson, union vice president, answering Mr. Young. The statement asserted that the affidavit issue was "false," that American Zinc refuses to deal with Mine-Mill because of disagreement on economic issues, and that the company is trying to "smash the union" because of the strike, rather than the Communist question).

Another Story

Precision Castings Co. had agreements with Mine-Mill in three of its four plants when the Taft-Hartley law became effective Aug. 23, 1947. Today Mine-Mill represents none of the employees.

This is not because the company is anti-union. The company decided not to deal with Mine-Mill because of the Communists among its leaders. It now bargains with the aggressive CIO auto workers and the AFL, and is quite satisfied.

This is what Mr. During told the Senate committee. Here's his story of what happened at the Precision Castings plants:

The company had union shop contracts with Mine-Mill at its Cleveland and Fayetteville (N .Y.) plants, where it produces zinc, aluminum and magnesium-alloy die castings, and at its plant at Kalamazoo, Mich., where it does buffing, polishing and plating. Its die and tool shop at Syracuse, N. Y., was, and remains, unorganized.

In the 1944 negotiations in Cleveland and Fayetteville, the union was represented by a man who in 1935 ran openly as a Communist for membership in Cleveland's City Council. In 1941, after Hitler attacked Russia, this same man left a position with District 50 of the United Mine Workers because he couldn't reconcile the then Communist war-intervention lines with isolationist views of the U. M. W. president, Lewis.

In negotiations on the same contracts in 1945 and 1946, the company had to deal with a member of the New York City Provisional May Day Committee for the May Day parade sponsored annually by the Communist Party.

Under the Wagner Act, the employees could not be told by the employer of the Communists in the union leadership and they were powerless to act if they knew it.

Under the Taft-Hartley law, Precision Castings employees were able to turn the left-wing Mine-Mill out of all three plants and accepted "unions of good reputation" in two of them. Here's how it happened:

The first test came in November, 1947, at the unorganized die and tool shop at Syracuse. Mine-Mill asked for recognition. The company

agreed if the union could get certification from NLRB. This was the same position the company had taken under the Wagner Act at all of its plants.

This the union could not do because of its officers' failure to file non-Communist affidavits. It asked that the company agree to an informal election outside of NLRB. The company considered the proposal, then decided to stand by the law. In fact, it filed an election petition of its own. NLRB had to dismiss it because of Mine-Mill's lack of compliance.

Meanwhile, Mine-Mill agreements at the other three plants were to expire March 1, 1948. The union filed notice of desire to amend them. The company said it would continue bargaining relationships only if, and when, the union complied with the requirements of Taft-Hartley. It explained its position in letters to all employees.

The union's die-casting division took a "no contract, no work" stand, branded the affidavits as "yellow-dog affidavits." The management reassured the employees that after March 1 it would maintain the same wages and working conditions "until proper bargaining relationships are again established."

One Issue Involved

Communism was the sole issue, so the company gathered all the evidence it could to support the charge that the union was Communist-controlled. It posted it in the Fayetteville plant, discussed it at employee meetings. Result: Fayetteville workers voted against a strike in late February.

At Cleveland, the union kept its members from attending meetings at which the company proposed to lay bare the union's Communist record. There, a strike vote taken earlier was allowed to stand. At Kalamazoo, the employees attended the "education" meeting despite union leader efforts to keep them out. Result: The workers disregarded an earlier vote to strike.

On March 1, the union picketed all four plants. Only the Cleveland plant closed, but it reopened five weeks later. Two weeks after that, the union called off the strike.

The Outcome

Here's what eventually happened at the three plants where Mine-Mill had contracts:

At Kalamazoo: A group of workers petitioned NLRB to decertify Mine-Mill as a bargaining agent. The AFL and CIO auto workers then got busy signing up members. The election went: For the CIO, 48; for the AFL, 20; for no union, 64. In a run-off election, the vote was 81 for no union, 44 for the CIO. (Under the Wagner Act, because a majority of those voting in the original election favored a union, the run-off would have been between AFL and CIO unions.)

At Fayetteville: Both the AFL and CIO petitioned for bargaining rights. Mine-Mill could not get on the ballot, so it campaigned for a "no union" vote. The result: CIO auto workers, 368; AFL, 269; no union, 22. A two-year contract was signed with the CIO auto union last July.

At Cleveland: The same CIO and AFL unions contended against each other, with Mine-Mill again urging a "no union" vote. The AFL won, getting 168 to 130 for the CIO auto workers. There were only 8 "no union" votes. There, too, a two-year agreement was signed in July.

Mr. During's advice to Congress:

Sections of the Taft-Hartley law which aided Precision Castings employees to get out from under a Communist-dominated union should be retained. These include (1) "free speech" for management as well as unions; (2) protection of union members against dismissal under a union security agreement because of expulsion from the union for reasons other than non-payment of dues; (3) right of employers and employees to file election petitions, and (4) non-Communist affidavits for union leaders. As to affidavits from employers, During said he would "gladly" sign one and "consider it a privilege to thus 'stand up and be counted' on the side of my country."

Still the Party Line

One needs only to read the newspapers—the metropolitan daily papers, the Communist Daily Worker and union newspapers—to know that the Mine-Mill leadership is still plugging the Commie line.

In a period of just a few weeks, we ran across these items:

A paragraph item in the Mine-Mill newspaper, "The Union," critical of Joseph Cardinal Mindzenty, who was sentenced to life imprisonment by the Communist-controlled Hungarian government for being a "spy."

Another item in the union's newspaper favorable to the Communist-backed Greek guerrillas and critical of President Truman and the Greek monarchy.

A Mine-Mill local in New York protesting Cardinal Mindzenty's imprisonment despite, the Associated Press reported, "repeated instructions from the union's international office in Chicago not to do so."

Mine-Mill about to be suspended by the Canadian Congress of Labor in "the latest in a number of moves taken by the CIO central body (in Canada) in the last two years to curb Communist infiltration."—*N. Y. Times.* (Subsequently, on Mar. 24, the union was suspended).

Repeated praise of Mine-Mill in the columns of the *Daily Worker.*

Mine-Mill international officers urging CIO President Philip Murray to continue CIO's affiliation, about to be severed, with the Communist-dominated World Federation of Trade Unions.

Vice President Robinson blaming Marshall Plan for unemployment.

Robinson criticizing President Truman for insisting on multi-power talks with Stalin.

A Mine-Mill local of iron-ore miners at Birmingham, Ala., seeking transfer to the CIO steel workers union because Mine-Mill "gets orders from Moscow."

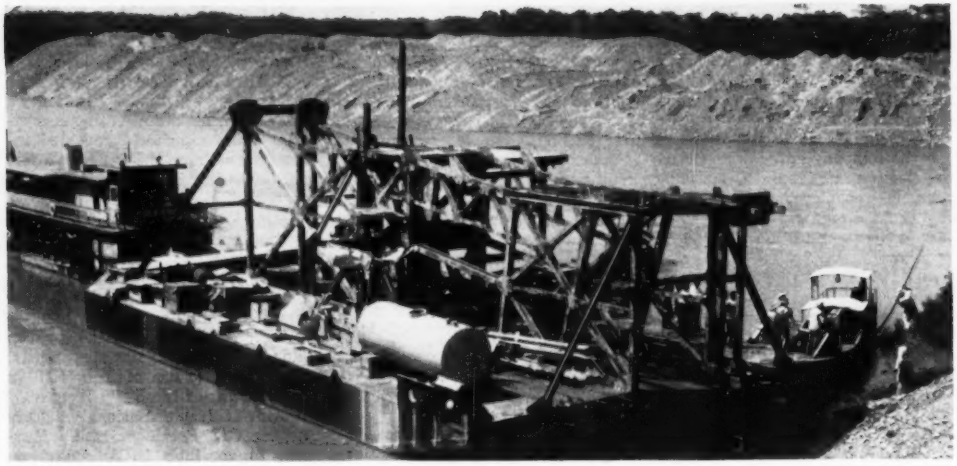
Why the Union Link?

If you want to know why the fight against Communism centers in the trade unions, an answer is supplied by Ben Gitlow, a Communist leader in the '20s who twice ran for president of the United States on the Communist ticket.

It is this quotation from Gitlow's book, "The Whole of Their Lives," put into the record of the Senate hearings on Taft-Hartley by Sen. Taft:

"Stalin wrote on the immediate tasks of the Communist Party the following: 'If therefore the Communist Parties wish to become mass parties capable of setting revolution afoot, they must create intimate ties between themselves and the trade unions and must find support in these industrial organizations.' . . .

"Getting control of the unions is therefore the No. 1 task of the Communist Party. By getting control of the unions the Communists mean getting control of the unions in the decisive, the basic industries of the land, the industries upon which the economic life of the country depends."



HULL AND MAIN FRAME, towed 450 miles to Pato, stand ready for erection of superstructure and installation of equipment.

Aluminum Dredge Designed for

Use of aluminum alloys cuts over-all weight of dredge about 100 short tons and decreases mean draft 10 in.

JOHN B. HUTTL
Associate Editor

A UNIQUE GOLD DREDGING enterprise that is being watched with keen interest by the dredging industry in the United States and abroad is the Porce River project in Colombia, S. A., of Pato Consolidated Gold Dredging Ltd., subsidiary of Placer Development Ltd., of Vancouver, B. C., Canada. Here, exploitation of gold-bearing gravels h'therto impossible to handle by mechanical means is to be carried out by a specially designed dredge, known as the Guayabal unit. It is one of 17 dredges operated by the parent company in Colombia and New Guinea.

NUMEROUS REEFS and torrential floods which have balked all attempts to mechanically work the Porce River, were the main problems in the design of the Guayabal dredge.

Steep and precipitous, the Porce River, a tributary of the Upper Nechi, flows between canyon-like rock walls and is crossed by frequent reefs and large boulders. To transport a dredge upstream requires blasting a clear channel through the reefs and removal of many of the boulders. The pay gravel lies in pockets, or bars, between the reefs. The river is subject to torrential floods for about 8 months of the year, with the water level sometimes rising 30 ft. in a few hours. The gravels have been worked for the past 400 years during the three-months' dry season by nomadic "barreteros," who build small wing dams of bamboo and brush, crawl down a ladder behind them, and bring up a pan, or *batea*, of gravel from the stream bed for washing at the river bank. Save for scattered bench gravels, all attempts to work the stream by mechanical methods have failed so far, chiefly because of the reefs and high floods. Careful study of these factors led to the design and construction of the Guayabal dredge.

Foremost problem confronting the designers of the dredge was to make possible easy and quick

HEAVY FRAME CONSTRUCTION, where practicable, employs aluminum-alloy plates and shapes, and Cor-Ten steel to reduce weight.

Difficult Placer Job

maneuvering during floods and reduce mean draft to a minimum. This was done by providing a streamlined hull, using aluminum-alloy plates and shapes and Cor-Ten steel wherever practicable in the construction of the hull and superstructures, and by installing winch equipment that lowers and raises the digging ladder in record time, and other features. Saving in over-all weight by the use of aluminum alloys amounted to about 100 tons, and mean draft was decreased by 10 in. The dredge was fabricated by various manufacturers in the United States and shipped to Colombia completely "knocked down." Hull and main frame were assembled in Barranquilla, launched there, and towed up the Magdalena, Cauca and Nechi rivers about 450 miles to Pato, where completion of the structure and installation are now in progress.

Construction Details

The Guayabal dredge is a 2-cu.ft. unit capable of digging 30 ft. below the water line. The hull is 92½ ft. long, 44 wide, 7½ deep at sides, and 7 ft. 10¼ in. at the central part of deck which has a straight camber of ¼ in. per ft. to both sides. Bilges are curved to 18-in. radius, and the bottom of the hull is raked fore and aft to ride more easily in the river current. The hull is divided into 45 separate watertight compartments. Internal bulkheads, framing and trusses in the hull, house-framing window sash, corrugated sheet covering, platforms, ladders, winch bases, pump seatings, and other parts are made from aluminum alloy. Bottom, side and deck plating of the hull are made from Cor-Ten steel. The main trusses on the deck, gantries, spud and digging ladder are mild structural steel. All rivets in the steel hull plating and where aluminum was joined to it are hot-driven, copper-steel rivets. Aluminum plates and shapes were joined with aluminum-alloy rivets, cold-driven, or special galvanized steel bolts.

The digging element consists of a ladder of the plate-girder type measuring 68 ft. between tumblers, seven-sided upper tumbler and cylindrical lower tumbler, and the bucket line proper made up of 2-cu. ft. buckets, closely connected. Pitch is 21 in. Pins used are 3¼ in. in diameter. When the ladder is inclined 45 deg. to deck level, the buckets will dig about 30 ft. below water level. At normal bucket speed of 35 f.p.m. and fairly continuous operation, the digging capacity should be about 80,000 cu.yd. per month under favorable conditions.

Situated in the after end of the pilot house, the ladder winch can raise the ladder in less than 2 min. A Lilly controller provides over-speed protection for the winch motor and prevents over-travel of ladder at the highest and lowest positions. The motor controls the lowering speed and stops the hoist when necessary. The magnetic motor brake and main drum brake are for holding only. The ladder winch brake, held on with a weight, will go into action if power fails.

Controls Are Centralized

Two 1¼-in. head lines and ⅞-in. bow and stern lines will hold the dredge in position, with infrequent use of the starboard steel spud. The lines are operated by two 4-drum winches, one port and the other starboard, on the main deck forward. All units are equipped with Air Flex clutches operated electrically from the pilot house as are the brakes on the head line drums which are applied with weights and released by compressed air. Side line and spare line drums are equipped with hand brakes. The two head lines have their lead in sheaves situated at the forward end of a special frame or gantry hinged at the bow—two legs straddling the digging ladder and tied together with a heavy cap well forward of the lower tumbler when the ladder is in highest position. The head line gantry carries walks extending to the lower tumbler bearings and other auxiliaries. Lowering and raising the gantry is effected through push button control by a standard electric hoist installed below the pilot house.

Undersize from the 4-ft. diam-

eter, 24-ft. long chain-driven revolving screen will be treated in the gold recovery plant situated on the port side of the deck aft. This plant contains two 3-cell, 42x42-in. Placer rougher jigs arranged with two jig cells in series. Both units are placed as close to the distributor as possible, with about 5 ft. of riffled sluices transversely between the jigs and tailing flumes. About 17 ft. of riffled sluices, 42 in. wide, aft of the jigs, carry slightly oversize material from the lower end of the distributor to the fore and aft tailing flumes.

Hutch Products Amalgamated

Hutch products from the rougher jigs will be passed over an 18-in., 2-cell pulsator cleaner jig, while those from the cleaner unit after dewatering will go to silvered amalgam plates. Tailings from this table will be treated in a 12-in., 2-cell pulsator jig. The hutch product will be ground in a small ball mill preparatory to passing over a smaller amalgam table.

Oversize from the revolving screen can be directed either to a rock chute or to a 24-in. conveyor belt, 45 ft. long, operating on the stacker frame. Motive power for the conveyor belt is furnished by a separate motor through a chain drive installed at the upper end of the stacker frame. The stacker assembly can be raised or lowered by a small standard electric hoist operated from the stern.

Water for the revolving screen and gold recovery plant is supplied by two 6-in. centrifugal pumps and one 4-in. centrifugal pump delivering a total of 2,600 g.p.m. A self-priming centrifugal pump with a 4-in. discharge is used for bilge service, with suction from all watertight compartments. Water for the hydraulic jet pumps which handle concentrates in the gold recovery plant is furnished by a 2-in. centrifugal pump.

Power Plant

Power for the dredge is supplied by a diesel-electric plant installed on the starboard side, aft. Power-generating units include three high-speed, 6-cylinder diesel engines mounted side by side at the after end of the deck house on the main deck, with the center line of the shafts parallel to the center line of the hull. Each engine is capable of developing from 160 to 180 b.hp. Only two units will be required for normal operation, leaving one spare engine. Any one of the engines can be connected to or disconnected from the load by friction clutches in the flywheel housings. Some 50,000 gal. of fuel oil can be stored in one of the center compartments of the hull.

Three d.c. generator groups are directly connected, each to one countershaft, and the three shafts in turn are tied together with V-belts so that all units operate at the same speed. Power for the two head line-side line winches and exciter is supplied by a dual generator driven by the outboard countershaft. The center countershaft drives the generator furnishing power for the main drive and ladder hoist motors. The auxiliary generator driven by the inboard countershaft supplies power to all other equipment. The main drive, ladder hoist, and the two head line-side line winches are operated on the variable controlled voltage system (Ward Leonard), while the remaining motors are d.c. shunt-wound. Final output speeds of these motors can be increased over the nominal basic speeds by shunt regulation. All motors, except those powering the revolving screen, jigs and stacker belt, are operated from the pilot house. Pressure switches, mounted on all pump discharges and on the air supply lines to all Air Flex clutches actuate pilot lights at respective controls in the pilot house, indicating to the operator that pumps are primed and running, and that the clutches actually are in contact.

The estimated displacement of the dredge under working conditions is about 500 tons.

Electrical Equipment

Primary considerations in the application and selection of electrical equipment in order were: (1) Positive and safe operation; (2) minimum weight; and (3) minimum space. The main drive, ladder hoist winch drive, and the head-line and side-line winch drives are variable voltage d.c. units equipped with heavy-duty, mill-type motors. Main drive motor output at full load is about 80 hp.; ladder hoist motor peak output, about 100 hp.; and each winch motor output, 50 hp. maximum. The generators mentioned previously are of special construction, designed for power shovel service, to conserve space. They employ split frames, split bearing brackets, split brush holder rigging, tapered shaft extensions, and other features to facilitate maintenance and any repairs that may become necessary.

All other power for the dredge is supplied by the auxiliary generator operating at 250 v.d.c. Simplicity of obtaining adjustable speed on a number of drives was the principal reason for selecting d.c. operation. Motors on these drives are all standard, shunt-wound units or gear motors of splash-proof construction with tropical insulation. The 25-k.w. exciter supplies power for excitation of variable voltage drives, about 10 kw. for lights for night operation, and for trickle charging of the engine starting battery. In the engine room is a small switchboard for control of the auxiliary generator and exciter, including the necessary distribution circuits. So far as was practicable, all control equipment for the standard d.c. motors was grouped in a single cabinet and mounted in the engine room on the panel alongside the switchboard.

Lighting

All normal digging operations can be performed by the winchman from his working seat, and all equipment control units can be reached by him with less than two steps to either side. Lighting equipment on the dredge is more or less standard, selected for special service conditions encountered. Two full-revolving searchlights, each of about 2,000,000 beam candlepower, are mounted port and starboard of the pilot house. As a fully charged 30-v. battery is continuously available, emergency battery-operated lights have been installed in the engine room and pilot house. Automatically controlled, they function immediately upon failure of the generators or any part of the primary power system.

Preparation of this article was made possible through the cooperation of Col. R. E. Franklin, general manager of Pato Consolidated Gold Dredging, Ltd., and a member of the executive staff of Placer Management, Ltd., San Francisco, Calif., a subsidiary of Placer Development, Ltd. The design of the dredge described was under the direction of B. R. Storsand, head of the company's design department. T. M. Googin, electrical engineer for the company, furnished the information covering the electrical equipment used on the dredge, and erection of the dredge now in progress in Colombia is under the direction of W. E. Anderson, chief dredge erector.

Applications in the Mining Industry

RECTIFIERS

1. Portable and ignition types for underground d.c. equipment.
2. Ignition types of electrolytic plants.
3. Battery chargers for shuttle cars, locomotives, etc.
4. Variable voltage fields on synchronous motors.
5. Magnetic separators, magnetic pulleys, and electromagnets.
6. Smoke precipitation in smelters.

PHOTOELECTRIC RELAYS

1. Control of mine block signals.
2. Pyrometers for furnaces or kilns.
3. Tunnel traffic control.
4. Limit switches for skips and cages.
5. Control of mine ventilation doors.
6. Smoke density control.
7. Conveyor belt protection.

ELECTRONIC RELAYS

1. Control of multiple drainage pumps.
2. To prevent sump pump from losing prime.
3. Control of mine hoist signal bell.
4. To indicate stopping of remote fan.
5. Control feed in selective media plant.
6. Control water level in tanks.
7. Overflow on feeder to kiln.
8. Control mine hoist from case.
9. Indicate overload on motor.

TIME RELAYS

1. Process control.
2. Control of feeder to hammermill.
3. Sequence starting of pumps.
4. Timing short intervals for welding and induction heating.
5. Timing devices for automatic ore samplers.

MOTOR CONTROLS

1. Pallet conveyor drive on sintering machine.
2. Speed control on metal working machines.
3. Variable-speed feeders for kiln and ball mills.
4. Sensitive controls corresponding to temperature and pressure changes.

CONTROL OF A.C. POWER

1. Resistance welding.
2. Electric furnaces.

BLACK LIGHT UNITS FOR:

Identifying and locating minerals.

LIGHTING

1. Mercury lighting.
2. Fluorescent lighting.
3. Germicidal lamps for change houses.

TESTING EQUIPMENT

1. Photoelectric recorder.
2. X-ray inspection.
3. Motor insulation testing.
4. X-ray photometer for qualitative analysis.
5. X-ray diffraction studies of minerals and compounds.
6. Dew-point measurement.
7. Detection of mercury vapor in air.

COMMUNICATIONS

1. F-M carrier current for mine locomotive and shafts.
2. Cage-to-hoist telephones.
3. Public address system.
4. Wire recorders.

How Mining Men Are Using Electronics Today

J. A. SETTER

Denver Office
General Electric Co.

MANY JOBS IN MINES, mills and smelters are now being performed with electronic devices which can be installed and operated as easily as other ready-to-use electrical units such as push-button switches, motors and transformers. Because this fact is not fully appreciated, this and subsequent articles will review the modern practical applications, (listed above), which have been evolved through close cooperation between mining operators and electrical manufacturers.

No attempt will be made here to go into the intricacies of electronic circuits, but in order to fully appreciate the usefulness of this type of equipment, let's first review a few simple principles.

What Is Electronics?

Electrons are negative charges of electricity which revolve about the center nucleus of an atom. An electric current as commonly considered is nothing more than a continuous flow of electrons through a conductor—generally metal, such as copper wire. It is also possible to conduct electrons through confined gases, vapors and vacuum tubes under certain conditions and to control the passage of these electrons. This phase of electrical science is called *electronics*, i.e., the science of controlling electricity which has been freed of the bondage of conducting metal wire.

This control is usually achieved in industry by means of a glass or metal enclosure or tube which is exhausted to a high degree of vacuum, and which may contain small quantities of rare gases or mercury vapor. The enclosure contains several metallic controlling units known as anodes, cathodes and grids in various constructions to perform specific tasks.

An electronic tube controls the flow of electric current through a circuit much as a valve controls the flow of water through a pipe. To start the flow of current through the tube, the first job of electronics is to force free electrons out of the metal cathode. One way is to yank them out with high voltage, another is to dislodge them with a beam of light as in a photo-electric tube. The most common way is to drive them off with heat either by building the cathode in the form of a filament of high-temperature metal such as tungsten as is used in an incandescent light or heating the cathode indirectly with another filament.

Once the electrons (negative) are dislodged they are attracted through the tube by the anode which

Rectifiers Are Important in Mining . . .

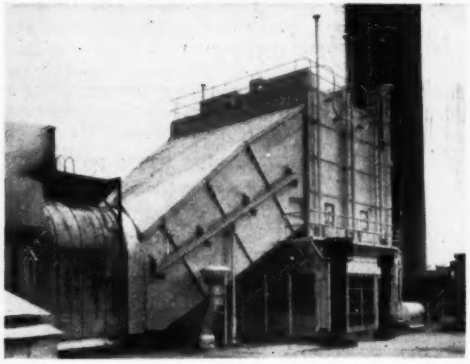


FIG. 1. This Cottrell precipitator removes solids from stack gases with high-voltage d.c. produced with electronic tubes.

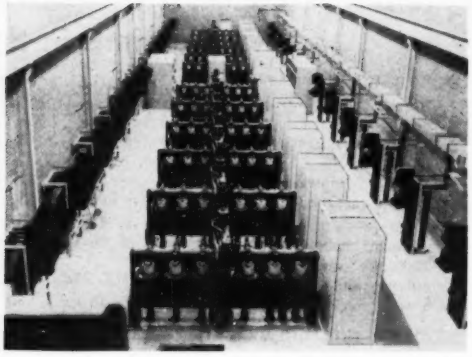


FIG. 2. Ignitron mercury-arc rectifiers supply d.c. for magnesium reduction. These tanks are large electronic tubes.

is charged with a positive voltage. Since a stream of electrons either in a wire or in space is an electric current, the electronic tube provides an ideal way to control such a current. For instance, if a lamp is connected in series with the tube and a source of direct current, the lamp lights as though a snap switch were closed. If, however, an alternating source is used in the circuit, the lamp lights only during the positive part of the a.c. cycle. During the negative half cycle, the anode, or plate is negative and thus repels the electrons from the cathode. The current flow through the lamp is then pulsating positive direct current.

Thus, we have the first principle of the rectifying or one-way check valve action of a two-element electronic tube, known as a kenotron or diode, which enables us to get direct current from an alternating-current source. Kenotron tubes are of the high-vacuum type, and as such are limited to applications requiring low current at high voltages.

Most industrial rectifiers require high currents at comparatively low voltages of 600 v. or less. The tube for this application is called a phanotron, which is a differently shaped two-element kenotron in which a very small amount of mercury or an inert gas such as argon is inserted. Some similar type tubes in which a third element called the grid is inserted and which contain mercury vapor or gas are called thyratrons. The flow of current through the tubes depends on the voltage relationship between grid and cathode. The few gas or mercury atoms in the tube cause a great increase in the electron flow. When electrons leave the heated cathode on their way to the plate, (i.e. when the plate has a positive potential which is higher than the cathode), some of them collide with the gas atoms and knock off a free electron from the orbit of each gas atom. These free electrons are also attracted to the positive anode to provide a heavy electronic flow. The action of the gas atoms also enables the tubes to rectify at comparatively low voltage on plate or anode.

Thus these phanotron or thyratron tubes have an important application in battery chargers for mining locomotives, magnetic separators in ore milling, large rectifiers for providing 275-v.d.c. for mining operations, and large blocks of d.c. power for the electrolytic production of aluminum and magnesium. Now we are ready to discuss groups of specific applications of tubes:

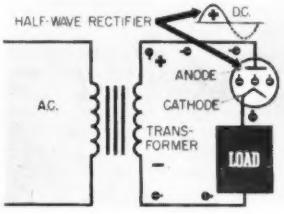


FIG. A. Single-tube half-wave rectifier.

Battery Chargers. A typical half-wave rectifier (Fig. A) consists of a transformer to step down the power supply to the proper voltage to charge the battery, together with a "Tungar" bulb connected as shown. The battery connects between the cathode of the tube and the transformer. Whenever the transformer lead connected to the anode is positive during any half cycle, electrons flow from cathode to anode. When this lead is negative during the next half cycle, no electrons flow.

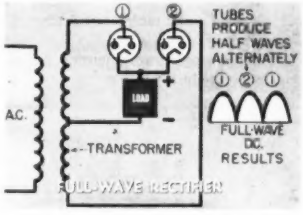


FIG. B. Double-tube full-wave rectifier.

To rectify both halves of the a.c. circuit, a full-wave charger is used containing two tubes, as shown in Fig. B. Here, a transformer with a center tap is used. During the half cycle that the transformer lead (1) is positive, tube (1) conducts current from the center tap through the battery to the anode. Tube (2) at this time is not working. Then during the next half cycle, lead (2) is positive and tube (2) conducts in a similar way. The battery thus gets two shots of d.c. for every a.c. cycle.

For battery charging in mining, a complete heavy-duty unit called "Phanocharger" operates on the full-wave principle described above. To make this charger automatic, it includes grid control of the tubes in its electronic voltage regulator that maintains its output voltage at a constant value, and has a current limit feature to prevent overloading of the power tubes and to limit maximum charging rate of the battery.

and So Are Photoelectric Tubes

FIG. 3. Electric eye in Colorado tunnel regulates movement of storage-battery locomotives to prevent haulage mishaps.

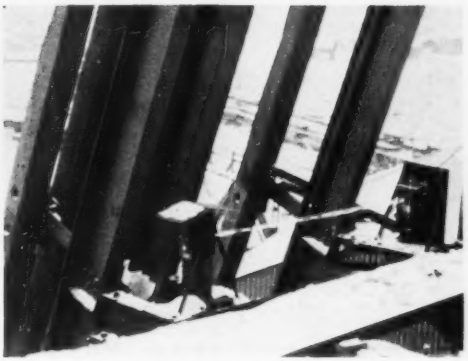


FIG. 4. Skip over-travel is prevented by an electric eye installed in the headframe of an Iron Country mine.

Rectifiers for Magnetic Equipment. Where a constant source of 125 or 250-v. d.c. is required, a similar type of phanotron rectifier is available, in which the voltage regulator is omitted. These rectifiers provide d.c. for magnetic separators and magnetic pulleys in various mining and milling operations. The same type rectifiers are used on large electro-magnets on cranes to handle scrap iron. Rectifiers of these types generally range from 1 to 25 kw. Larger ones are available for special applications.

Rectifiers for Synchronous Motor and Generator Fields. The electronic exciter is a conventional full-wave rectifier with the added feature of grid control to vary output voltage. This is done with a small radio-type rheostat which can be located remotely. The compact rectifier can be installed in the synchronous motor-starter cabinet and connected to automatically apply the field at the proper time.

Rectifiers for Precipitators. These rectifiers use high-vacuum, two-element (diode) tubes called "kenotrons." A kenetron-type tube cannot emit very many electrons unless the anode or plate voltage is very high to attract the electrons. This quality, however, makes them useful for electrostatic precipitation of ore and smoke particles in smelters. Very high voltages of the order of 75,000 v.d.c. or higher, are required to charge the small particles electrostatically, but very little current is required. These negatively-charged particles are then attracted to plates or electrodes of positive polarity where they are deposited, to be collected at suitable intervals.

A typical high-voltage precipitator transformer with kenotron tubes, control panels, etc. is installed in the breeching of a smoke-stack shown in Fig. 1.

One of the earliest precipitators was used to remove arsenic dust from flue gases. The value of the recovered products, however, more than paid for the precipitator. Since then, precipitators have been used by many mining companies to recover metals and non-metallics from the waste stack gases.

Ignitron Rectifiers for Mining. During the past 10 years ignitron rectifiers with total capacity exceeding 100,000 kw. have been installed in underground mining operations, particularly in coal mines. Both stationary and portable types are in use.

For mines using 275-v. d.c. for haulage locomotives and mining machines such as cutters, loaders, and drills, full voltage must be maintained at the mining face to get maximum production from the machines. Portable rectifiers can be kept near the face, giving minimum voltage drop, using less copper, and reducing kwh. losses. The full load efficiency of rectifiers is about 92% compared with 87% for a motor-generator set. At light load the rectifier efficiency is still up to 90%, whereas the M-G set drops down below 75%.

Most mining rectifiers use six ignitron-type mercury tubes which are permanently sealed. These tubes are always used on a three-phase power supply with a six-phase double Y-connected transformer. These ignitrons are built with an "ignitor" or spark plug which is fired in proper sequence like a six-cylinder engine. The resulting d.c. voltage wave is very uniform, as compared to the single-phase, full-wave rectifiers used for battery charging.

Fully automatic ignitron rectifiers require little or no supervision and maintenance costs are negligible. Resulting higher efficiency of converting a.c. to d.c. cuts costs.

Ignitron Rectifiers for Electrolytic Refining. In terms of the greatest number of kilowatt-hours of energy consumed every year by electronic tubes, the electrolytic production of aluminium, copper, magnesium, and zinc far surpasses everything else. In fact, it is estimated that more than 10% of all the electricity generated in the United States every year passes through these electronic tubes. At present there is now installed nearly 4,000,000 kw. of electro-chemical conversion equipment in North America.

A typical large installation of rectifiers in a magnesium refining plant is shown in Fig. 2. Each rectifier assembly consists of 12 single-anode ignitron tanks. As these tanks are so large, it is not feasible to hermetically seal them. Hence each rectifier is provided with a continuous vacuum pumping system. The connections are similar to the sealed ignitron described above. However special connections allow the rectifiers to be arranged for 12, 24, or more phases depending on the kw. rating of the rectifier and other operating conditions.

These individual ignitron tanks allow the anode to be placed close to the cathode which increases the efficiency up to about 95% and simplifies replacement or repairs.

The electro-metallurgical process is divided into these three groups.

A. The electrolytic extraction of

Photoelectric Units in Surface Plants

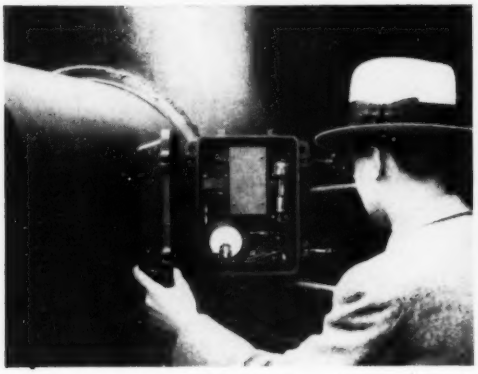


FIG. 5. Photoelectric unit installed in chimney detects and records smoke density. Units like this can also sound alarms.

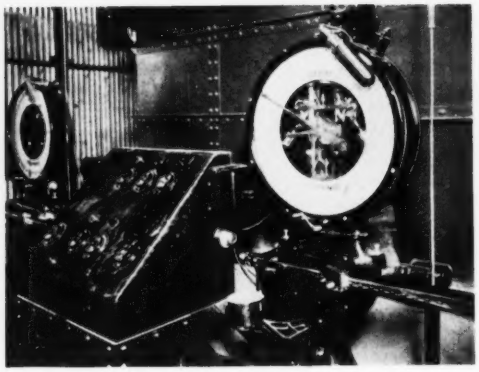


FIG. 6. Batch mixtures are controlled automatically by this electric eye installed on scales weighing ingredients.

metals such as copper and zinc directly from a leached solution of the ores. This requires about 10,000 amp. at 500 to 750 v. depending upon the number of electrolytic cells in series. (Approximately 1 lb. is produced for $1\frac{1}{2}$ kwh.).

B. Electrolytic refining of metals such as copper, lead and zinc. Approximately 19,000 amp. is required but the voltage need only be from 125 to 300 v. (Approximately 1 lb. is produced for 1/6 kwh.).

C. Electrolysis of fused metallic salts. Metals such as aluminum, magnesium, beryllium, and sodium are produced from a molten bath, with the direct current producing the heat.

A typical aluminum cell line takes from 30,000 to 60,000 amp. of d.c. at 600 to 850 v., depending upon the type of cell. Approximately 10 kwh. are required to produce a pound of aluminum or magnesium. This is why refining plants are located near hydroelectric generating plants where electric power is cheap.

The electrolytic industry, now one of the most important consumers of electrical energy in the country, consumes some 30 million kwh. of energy a year.

Photoelectric Devices

Photoelectric Relays. A simple photoelectric relay contains a photo tube, or electric eye, which has the property of starting an electron flow when light shines on a circular cathode coated with a rare element such as caesium. This current is very minute, being of the order of perhaps one millionth of an ampere which, because it is too small to do any useful work, must be amplified by another tube, called a pliotron, which controls a secondary circuit powered by a battery or a transformer. The secondary circuit operates a magnetic relay which controls the working circuit to start a motor or perform other tasks.

Photoelectric Traffic Control. One installation at a large copper mine in Utah controls vehicles in a one-way highway tunnel.

If the driver of a car observes a green traffic light, indicating a clear tunnel, he enters and the car cuts a light beam shining across the tunnel. This turns on a red light at the other end of the tunnel to stop oncoming cars. At the same time an automatic counter indicates there is one car in the tunnel. For a definite time period, a preset number of cars—all of which are counted—can enter in the same direction. As they emerge from the other end, another photoelectric relay checks them out and then changes the traffic lights back to green for cars in the other direction. Another electronic device called a photoelectric recorder checks the volume of carbon monoxide exhaust gases and automatically starts the ventilating fans in the tunnel.

A photoelectric block signal system was recently used to regulate train traffic safely during the driving of a 13-mile single-track tunnel under the Continental divide near Denver. See Fig. 3. Similar traffic control types are used in the Homer mine in Michigan, and at Climax Molybdenum Co. in Colorado.

Photoelectric Limit Switches. Fig. 4 shows a photoelectric relay used as a skip overtravel protective device in the shaft of a large iron mine.

A similar relay has been installed near Denver, Colo., in a double shaft mine to stop the cage at the ground level when handling men. Ordinarily the cage dumps the ore into a bin at the upper level. A lever type switch is not feasible at the ground level because it would operate on every ore trip. With the electric eye, the light is turned on whenever men are to be handled. When either cage comes to the ground level, the light beam is cut and a bell rings to warn the operator to stop the cage, or cut off power.

A photoelectric relay performs another task in controlling the dumping of ore trucks in a Minnesota iron mine. Here the truck backs into the unloading ramp until it intercepts the light beams to two separate electric eyes. When both relays operate, a solenoid air valve opens a dump pocket and the ore can be discharged safely.

Many times, due to faulty feeder operations, or to large chunks, the load on belt conveyors is built up too high. This may overload and damage the belt. A light source shining across the proper height on the belt to a photoelectric relay will immediately sound an alarm, or shut down the feeder if loading is faulty.

Photoelectric Door Openers. When a mine locomotive approaches a ventilation door, the door can be opened by a "Thrustor," which is a motor-driven hydraulic plunger device connected to a crank mechanism to open the door smoothly without jerking. This Thrustor mechanism is controlled by a photoelectric relay installed on each side of the door about 20 or 30 ft. away. When the locomotive cuts the light beam in either direction, the door opens. An electronic time delay relay recloses the door a few seconds later

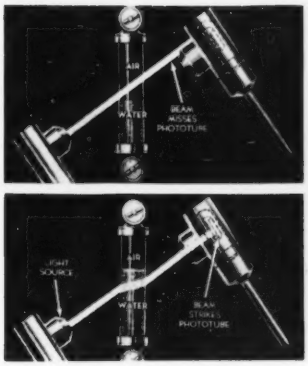


FIG. 7. Phototube above serves as an automatic liquid-level regulator.

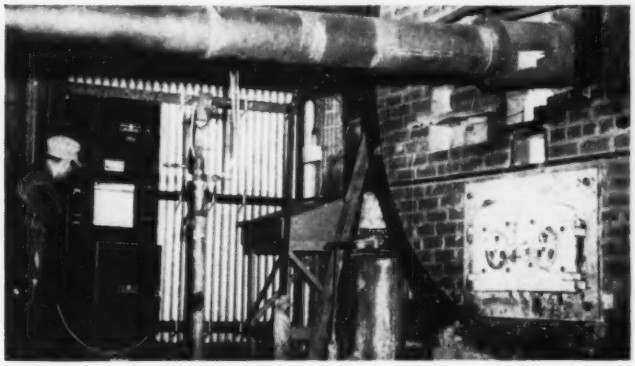


FIG. 8. Photoelectric pyrometer panel at left contains a double-chart recorder, amplifying equipment, and a speed-regulating device to control kiln temperature.

to make sure the locomotive or train has cleared. While the train cuts the light beam the door cannot close. This same type of system can be used in mine warehouses and elsewhere where doors have to be opened.

Smoke Density Control. Wasteful smoke in mine power plants can be prevented by installing a special electric eye in the breeching or chimney, and shining a light across the smoke column. A bell rings whenever the smoke thickens beyond a predetermined amount thus warning the operator. See Fig. 5. This equipment can be supplemented with a smoke density recorder for study purposes. It could also be used in smelting operations to give better control of the process.

Water Turbidity Control. Often a mining community's water supply comes from abandoned mines. The normally clear water from such sources may become discolored or turbid at times because of caving ground, and an electric eye installed in a section of pipe can give an immediate warning. In a town in Minnesota, for example, water is drawn from an abandoned iron mine. Photoelectric relays control a solenoid-latched check valve, which upon detection of the discoloration, diverts the turbid water to a drainage ditch and sounds a warning. After the water clears up, an attendant resets the valve.

Photoelectric Relays for Indicating. During the past few years the sizes of electric shovels for open-pit and strip mining have been increased immensely, some weighing 1,500 tons or more. They are self-propelled, with large caterpillar trucks at each corner of the machine, and generally must be moved slightly every 45 to 60 min. As the shovels travel over rough ground, a hydraulic jack is used at each corner, directly over the truck, to level the frame of the machine after each move up, as well as to equalize the pressures on the four corners during the moving operation.

The leveling is controlled on these shovels by photoelectric relays and lights. The operator merely presses a button in the cab to start the leveling process. When the light beams coincide with the electric eye at the level position, a signal light in the cab indicates when the operation is complete. Leveling is accomplished with an error of less than half a degree within less than half a minute.

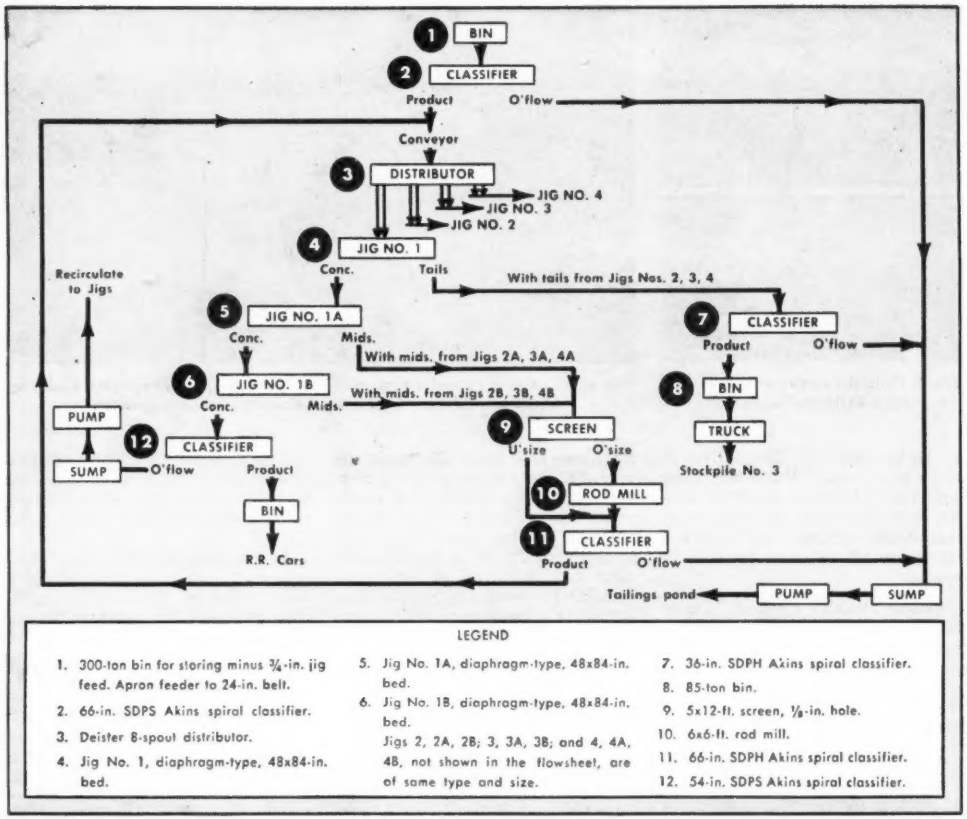
Photoelectric Process Control. In many milling and smelting operations the weight of materials added in the process must be weighed accurately and automatically. By adapting a photoelectric relay to a beam scale or a dial scale, the light source is broken by the beam or pointer when the proper weight is reached. See Fig. 6. The relay can then shut off the feed of the material being weighed and perhaps dump the load or start it on its way as in the case of a skip of ore.

Other processes may require the maintaining of definite levels of liquid in a tank. By using a conventional gage glass to indicate the height desired, a photoelectric relay mounted as shown in Fig. 7, will operate when the water reaches the correct level, due to the refraction of light through the water. When the water level drops, the light beam misses the phototube.

Temperature Control. A photoelectric relay can measure and control the temperature of a furnace or kiln ranging from 1,400 F. to 3,300 F.

In this case, we have a real "electric eye" which is more sensitive than the eye of the old blacksmith who estimated the temperature of the hot iron by various colors. Of course, he never heard of Wiens Law that a heated body radiates energy with an intensity depending on the temperature and gives off color from the infrared end of the spectrum through the orange-yellow and white. The electric eye, however, has the property of responding to these various colors due to the temperature and changes the amount of electrons flowing from the cathode to the anode accordingly. Calibration curves can therefore be calculated for various types of photoelectric tubes over definite temperature ranges. The amount of current generated is only a few millionths of an ampere and consequently must be amplified with various types of pentode tubes to operate sturdy recording or indicating instruments. A typical photoelectric pyrometer installation panel is shown in Fig. 8 controlling the temperature of a kiln. The phototube is focused on a definite hot spot in the furnace by means of an optical system and lens. The relay panel amplifies this current, and may provide controlling points to make external adjustments in rate of feed of fuel or material to hold a constant temperature in the furnace.

In subsequent articles, the author will describe other applications of electronic devices taken from the list that is given in the table on page 75.



FLOWSHEET OF CHARLESON JIG PLANT. Only the first series of the four parallel series of three jigs each is shown. Concentrates are made on only the third (designated as B) jig in each series, tailings on the first one of each series.

Charleson Lean-Ore Plant to

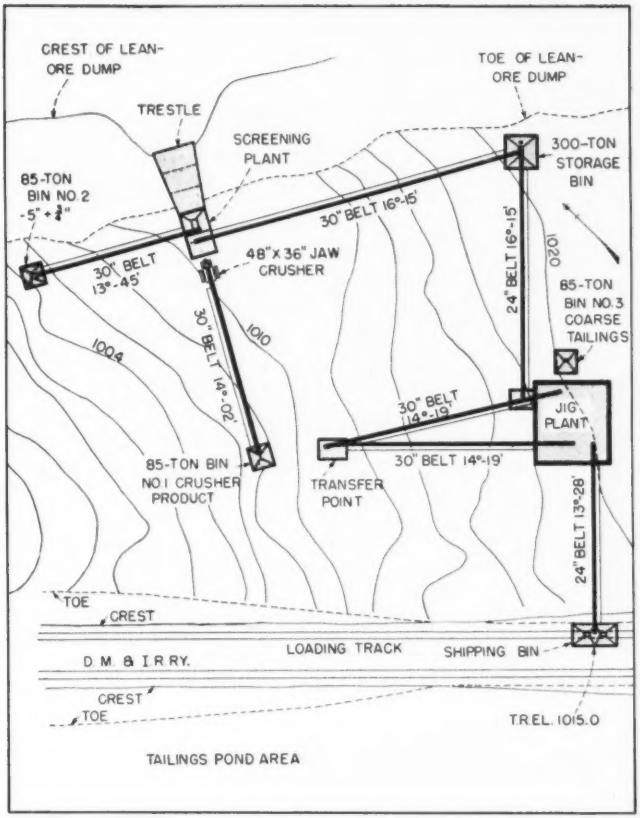
R. W. KEEHN
Consulting Engineer
Nashwauk, Minn.

AS THE 1949 iron-ore-shipping season starts in the Lake Superior Iron Country the Charleson Iron Mining Co. is placing in operation a new jig plant to beneficiate iron ore in the Missabe Mountain-Minnewas lean-ore stockpile. This stockpile is about a mile and a half east of Virginia, Minn., on the Mesabi Range. All the plants, bins and conveyor structures are built of wood. Construction and placing of machinery have been handled under the direction of J. C. Henry, superintendent for the company. The belt system and the plants that are here described were designed by the author.

The Missabe Mountain and Minnewas mines were opened up in 1893. In working them up to 1941, the lean ores encountered in various horizons were stockpiled, locomotive haulage being used. The physical properties of this lean ore are of such a nature that a merchantable product cannot be satisfactorily made by using a straight washing process. The present flowsheet was determined by Charles H. Remer, vice president of the company, who made many experiments before deciding on the procedure. The flowsheet is shown above.

In one of these tests the minus-¾-in. plus-4-mesh material was treated by the heavy-density process and the minus-4-mesh material was jigged. The result was inferior to that obtained by jigging all minus-¾-in. material with a middling circuit and rod mill included. The jigs were developed by Mr. Remer. From this test and others they were found to be the most efficient main beneficiation units available for this type of ore. They are the heart of the plant. Other machines are required to prepare their feed and dewater their concentrates, as described in the following text.

The accompanying flowsheet and plan map will illustrate the flow of



SITE OF THE CHARLESON JIG PLANT, in plan view, showing the position relative to the 300-ton storage bin and the other units designated.

Treat Old Stockpile

the crude-ore plant feed from the lean-ore stockpile through the plants and into the concentrate shipping bin and into stockpiles No. 1, No. 2 and No. 3. A 2-cu.yd. diesel shovel will load the lean ore into 15-ton Euclid trucks. These will deliver to the receiving hopper at the screening plant. Here the material will be separated into three sizes. The plus-5-in. will go to a 48x36-in. jaw crusher set to 5 in. A 30-in. conveyor belt will take it to an 85-ton bin, where it will be loaded into a truck and taken to stockpile No. 1. The minus 5-in.-plus-¾-in. material will go similarly to stockpile No. 2. Minus-¾-in. material will go via a 30-in. belt to a 300-ton surge bin, and from that it will be taken by an apron feeder and a 24-in. belt conveyor to the jig plant.

In the future, some, or all, of the material in stockpiles No. 1 and No. 2 will go through the jig plant. To do this, it will be necessary to crush to minus-¾-in. A 4¼-ft. cone crusher will be installed at the head end of the 24-in. belt between the apron feeder and the 66-in. Akins. Space and head room have been provided for this future installation.

There are 12 jigs. They are arranged in four batteries of three jigs each in series. Thus the concentrates will be produced at the end of the third or last jig in each series. This practice differs from the customary procedure of discharging concentrates from each individual jig.

The jigs are of the diaphragm type and have a 48x84-in. bed. They have a patented dam and gate that extend across the entire bed of the machine.

Coarse jig tailings will go into an 85-ton bin and thence to stockpile No. 3.

The material in the three stockpiles will be placed there by trucks rather than by belt conveyors. The tons-per-hour involved will be comparatively small and the stockpiles irregular in shape, due to inadequate space. A flexible hauling and disposal unit is therefore indicated and a truck, in this particular case, would apparently be much more efficient and economical than belt conveyors.

There are five 30-in. and two 24-in. conveyor belts that will handle the ore from the time it is dumped into the screening plant until it arrives at the concentrate shipping bin or at the three stockpile bins shown in the drawing.

New Tailings Disposal

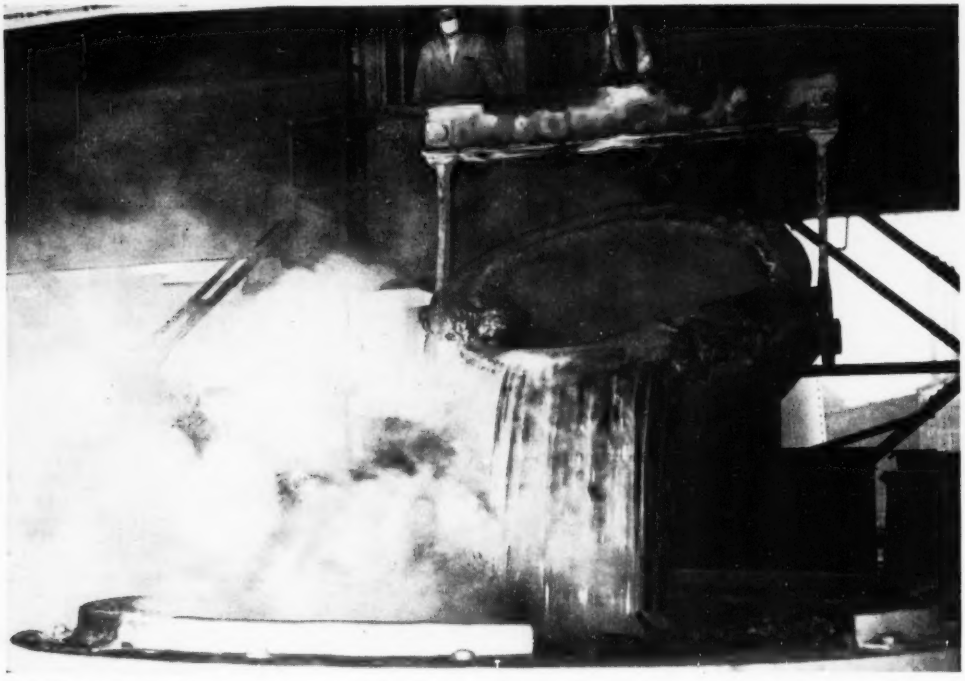
Fine tailings will be pumped into the tailings pond which is situated on an area lying west and southwest of the plant site and the D. M. & I. R. Ry. tracks. The ground there slopes decidedly down to the west, on about a 6% grade. At present, therefore, it is necessary only to have a dam on the west side to confine the tailings. The tailings line will run from the sump, adjacent to the plant, across the tracks and on the inside of the dam at the same elevation as the top of the dam, for its entire length. In the bottom of this pipe there will be 1-in. holes 30 ft. apart to enable the coarser tailings, in this line, to build up on the inside of the dam.

By this method of disposal, the coarser tailings in the pipe line will be so placed that they will be readily available for any probable future use and the dam will also be strengthened.

To have the new plant on property controlled by the Charleson company the only site that was available was that which it now occupies. This area now is none too large, as the plan map on this page will indicate.

However, the material from the lean-ore stockpile, adjacent to the plant, will be moved first to permit more room for the plant stockpiles and any other installations that may be required in the future.

Broken Hill Associated Smelters, South Australia

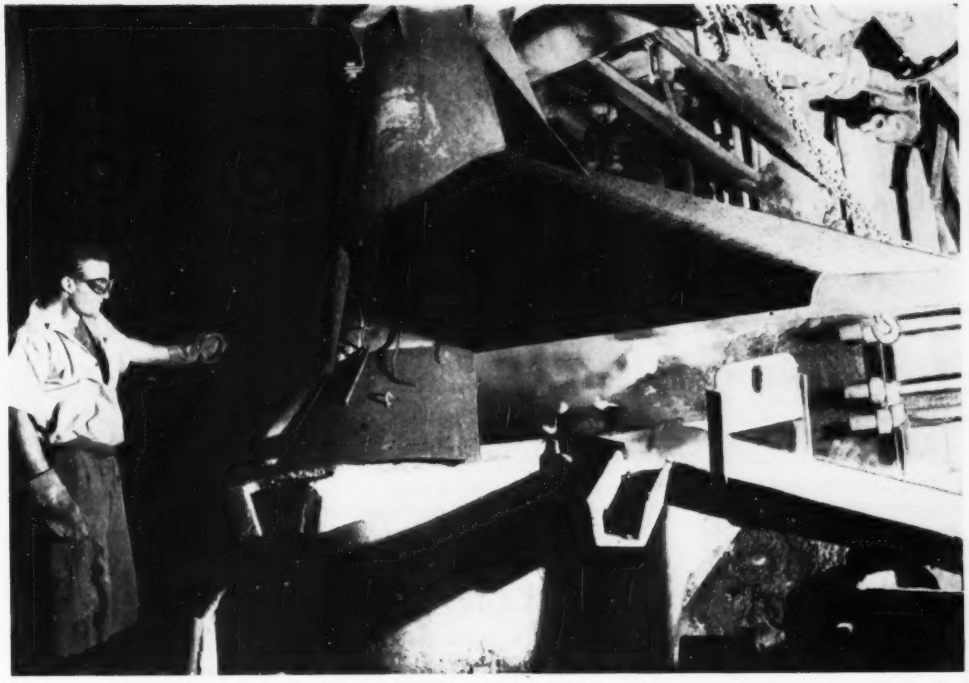


DROSSING KETTLE, 100 tons capacity, receives ladleful of bullion. Pictures from Australian Government Trade Commissioner, New York.

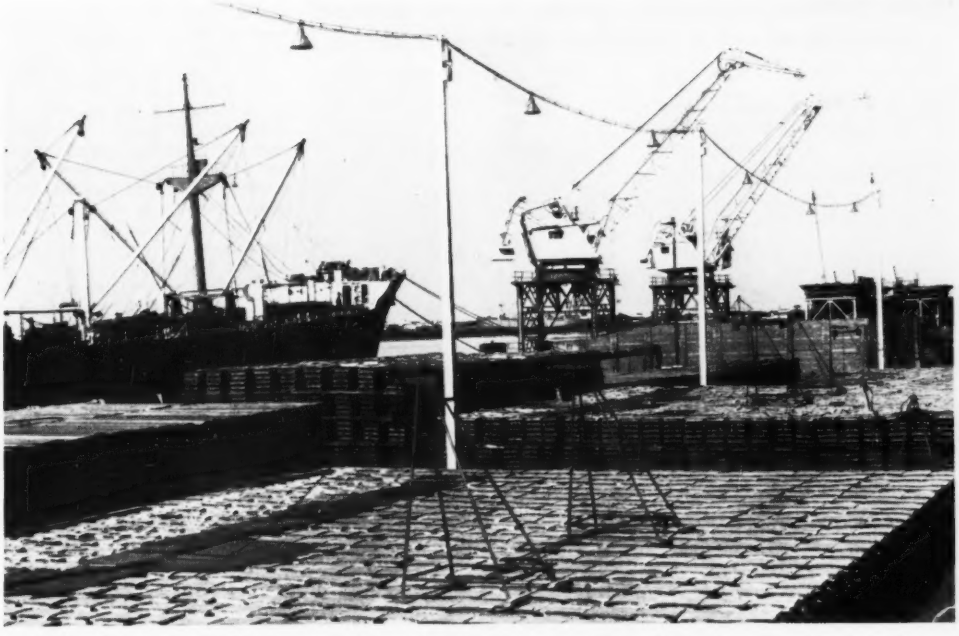
Shots at Port Pirie Smelter

BARS OF LEAD ARE REMOVED from Newnam molding wheels, taken in stacks of 60 by electric lift truck to wharf for shipment.

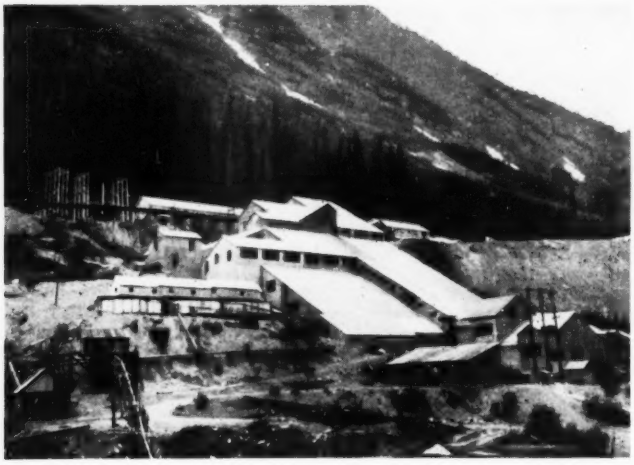
SILVER INGOTS, of 1,000 oz. each, are one of Broken Hill's final products. Gold has already been separated.



RUNNING SLAG from molten bullion via the launder in left center.



LEAD FOR EXPORT as it awaits shipment overseas. Bars weighing 56 lb. each have been stacked by lift trucks carrying 60 at a time, or 1½ long tons. The smelting works are owned jointly by the companies operating at present at Broken Hill.



AT HOLDEN CONCENTRATOR. The pump house and wood-stave pipe system for backfilling stopes with tailings is seen in lower left corner. Mill capacity is 2,500 tons per day.

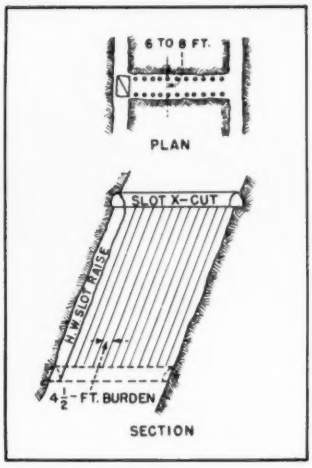


FIG. 1 Cutting the slot to provide a free face for blasting.

Some Underground Changes at

Ore production has been maintained by improved efficiency in blast-hole diamond drilling. Increasing rock pressures below the 1,500 haulage level have been controlled by filling worked-out stopes with mill tailings and revising the stoping sequences.

JOHN B. HUTTL
Associate Editor

WASHINGTON'S LARGEST base-metal mining enterprise, the Holden mine of Howe Sound Co., has been in continuous operation for more than 10 years save for a short strike in 1939. It is in the Chelan Range, on Railroad Creek, 52 miles northwest of Chelan. Ever since development and construction work started in 1937, the mine has provided employment for several hundred workers and tax revenues for the state. During World War II it contributed a substantial tonnage of copper and zinc. Last, but not least, the idea that no large mine can be developed in the Cascade Mountains has been refuted.

Miscellaneous Data on Stopes

Depth of fill, vertically	227 ft.
Average horizontal area	15,000 sq. ft.
Average width	55 ft.
Average length	280 ft.
Dip of footwall	65 ft.
Solid rock	10.3 cu.ft. per ton
Sand tailing	18.87 cu.ft. per ton (15% retained moisture).
Volume broken and sloughed	4,016,000 cu.ft.
Volume broken rock estimated in stope	221,000 cu.ft.
Volume development rock dumped into stope	465,000 cu.ft.
Volume above elevation 3,522 not to be filled	225,000 cu.ft.
Volume to be filled to elevation 3,522	3,105,000 cu.ft. (165,500 tons)

Originally, the Holden mine was developed and a mill built for a daily production of 1,000 tons (*E&MJ*, Jan., 1938, pp. 32-35). Production gradually increased until it averaged nearly 2,250 tons a day in the war years.

Operation continued in normal manner until late in 1941, with relatively few changes underground. After Pearl Harbor the picture changed. Wartime demand for more metals called for new schedules and methods. The management reinstituted the bonus system, discontinued after the strike in 1939. It proceeded to mine, under the Premium Price Plan, low-grade ore found by previous drilling in the western section of the mine. It changed the mining methods and temporarily stopped development work. A marked improvement in output per man resulted.

To give a better picture of the situation, a brief description of the development and geology will be helpful. The Holden mine is in a roof pendant that has been subject to intense metamorphic action. The rocks are gneiss, schists and quartzites cut by later granitic dikes. The geology is complex. All the rocks have two things in common —they are hard and abrasive. Minerals present are chalcopyrite, pyrite, pyrrhotite, sphalerite and small quantities of galena. Gold is

is illustrated with respect to certain details.

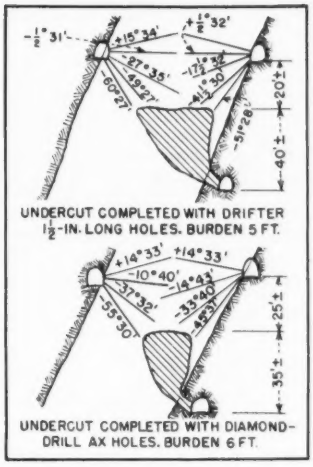


FIG. 1A. The undercut is completed as shown in these two sections.

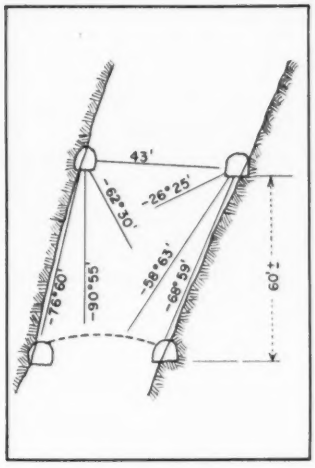


Fig. 2. Typical ring with AX diamond-drill holes. Burden 8 ft.

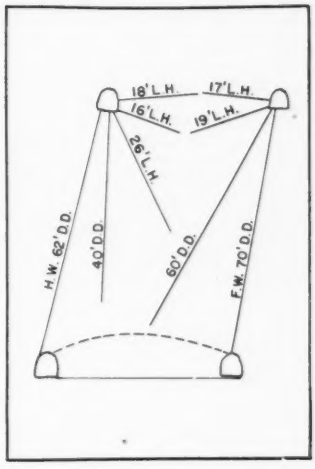


FIG. 3 Typical ring with diamond-drill and drifter long holes.

the Holden Mine

distributed without apparent relationship to levels or walls, but appears to follow copper trends roughly. Zinc concentration generally appears near the footwall. This wall is usually well defined. Hanging-wall limits must be determined by assaying.

The Orebody

As originally developed, the orebody was about 800 ft. long, 30 to 80 ft. in width, and dipping 60 to 70 deg. Early development consisted of five levels, the 300, 550, 800, 1,100, and 1,500. The last was selected for main haulage. These workings were serviced by No. 1 shaft and several 5½x11-ft. ore passes on 200-ft. centers. The 9x13-ft. vertical shaft is well in the footwall and 936 ft. deep. All development was laid out to permit exploitation by a combination of powder-blasting and bulldozing chambers of that part of the orebody extending about 1,100 ft. from the 1,500 haulage level to just below the 300-ft. level. Ore was broken by this method almost to the end of 1944. Powder-blast chambers were loaded with a semi-gelatin explosive, the confined velocity of which was 19,000 f.p.s. The primer, embedded in the center of the charge, consisted of a third of a case of 60% N.G. dynamite, with two No. 6 electric blasting caps in series. A special blasting line running from the main portal through several locked switches was used for firing. During the period in which this stoping method was employed 236 blasts were shot. Explosives used totaled 58,731 cases. A factor of 0.889 lb. of powder per ton of ore broken was obtained.

No. 2 shaft was started in 1941 to service the 1,600, 1,775 and 1,950 levels, opened previously from an exploratory winze. It was deepened to a point 1,217 ft. below the 1,500 main haulage level during the period when the mill was down between November, 1946, and August, 1947. The shaft measures 12 ft. 6 in. by 18 ft. 10 in. outside the timbers and has five compartments to accommodate the two skips, the cage and its counterweight and a manway. A 600-hp. double-drum hoist operates the 4-ton skips, and cage and counterweight are handled by a 150-hp. double-drum hoist. Two additional levels, the 2,325 and 2,500, were opened after sinking was finished. Between the 1,950 and 2,325 levels is the 2,125 level, used for main haulage. The deepening of No. 2 shaft and the establishment of new levels were necessary to conform with the new sequence of mining to be described.

To continue crushing underground, a second crusher room was established just below the 2,500 level. It is like the one on the 1,950 level. The crusher, 36x48 in. in size, was taken from the mill and installed last May 9 without interrupting underground work. It will handle all ore broken in the 2,125-level stopes now under active development, and the ore from the 2,500-level stopes which will be developed later.

Blast-Hole Diamond Drilling

Experiments with diamond-drill blast holes were first undertaken in 1941. Comprehensive tests employing the Noranda and Aldermac methods and the Holden flat-hole system and combination thereof were made in different parts of the mine. Choice fell on the Noranda method. Since 1944, all new development below the 1,500 level has been laid out for this method, parallel drifts being driven on hanging wall and footwall, hole depth being limited to 70 ft.

For a time the rings were drilled with BX bits (1-3/16-in. holes) and an average burden of 6 ft. Ore production per linear foot was about 4 tons. Later experiments proved that larger holes had merit. This led to the adoption of AX bits (1-15/16-in. holes). The burden was increased to 7½-8 ft. and a factor of 8 tons of ore broken per linear foot was obtained. Use of the AX coring bit also makes it possible to sample in advance the ground to be blasted.

Other refinements adopted in-

clude placing the slusher drifts a short distance outside the footwall of the ore to strengthen the collars of the draw holes, and increasing the distance between draw points to provide greater pillar protection over the slusher drifts. Spacing between draw points now varies from 30 to 40 ft. Draw holes are belled out with conventional drifters and stopers, the undercut being subsequently completed with diamond-drill blast holes or percussion-drill long holes (see illustration).

Locating the Walls

The location of footwall and hanging wall is determined by diamond drilling at 50-ft. intervals along the main levels. These are always driven in the footwall. Both horizontal and plus-45-deg. holes are drilled from each station. With the results of this program, the chief geologist outlines the position of the orebody on detailed geologic plans and sections. These maps form the basis of stope-development plans.

Actual stope layouts are made by the chief engineer in collaboration with the mine superintendent and chief geologist. This teamwork in planning results is the most practical approach to mining any block.

Paralleled blast-hole drifts are established at 60-ft. vertical intervals. The slots needed are broken out as shown in Fig. 1. Briefly, a raise is driven on the hanging side. When it is completed, drilling and blasting proceed on retreat to the footwall. The drill round consists of two AX diamond-drill holes spaced 6 to 8 ft. The burden averages 4 ft.

Fig. 2 shows the layout for the ring generally used in stoping.

New Drilling Combination Uses Tungsten-Carbide Bits

The ring in Fig. 3 uses a combination of AX diamond-drill holes and holes drilled with tungsten-carbide bits on extension rods.[1] The latter ring has given good results and is being used increasingly. Equipment for the long-hole drilling consists of 3-in. automatically-fed drifters using $1\frac{1}{2}$-in. tungsten-carbide bits. These bits are on 1-in.-quarter-octagon rods using type-H couplings. Holes up to 35 ft. long are drilled.

Good results have recently been obtained with 2-in. bits on rods of 1-in.-quarter-octagon steel with couplings, and $3\frac{1}{2}$-in. automatic drifters. Maximum hole length drilled is 35 ft. plus. Being practically of the same size—2 in. and 1-15 16 in.—the percussion-drill bit and the AX bit make an effective combination.

Apart from reducing diamond-drill bit costs, it has been found that more footage per bit can be obtained from the tungsten-carbide bit in long-hole drilling than in short-hole work, chiefly because of the cushioning effect the long rods have on the bit proper. The couplings, acting as guides, prevent excessive rod vibration and side whip.

Experiments are also being conducted with hard-faced detachable bits. Results obtained so far have been encouraging. Footages up to 12 ft. per bit have not been uncommon.

Blasting the Rings

All AX holes are blasted with 60%, $1\frac{3}{4}$x12-in. gelatin dynamite. Each hole is loaded solid to within 2 ft. of the collar. Electric blasting caps are used to detonate simultaneously all loaded ring holes. The holes drilled by drifters and tungsten-carbide bits are loaded with 60%, $1\frac{1}{8}$x12-in. gelatin dynamite when $1\frac{1}{2}$-in. in diameter, and with 60%, $1\frac{3}{4}$x12-in. dynamite of the same kind, when the diameter is 2 in. Average powder consumption for stoping slots and the undercuts is 0.23 lb. per ton. During the first six months of 1948, tons of ore broken per foot of dynamite in hole was as follows: Undercuts, 3.19; slots, 1.37; and stoping, 5.55 tons.

Broken ore drawn from the undercuts into the 7x8-ft. slusher drifts is moved to loading points by 60- and 66-in. solid and hinged-type heavy scrapers. These are worked by 50-hp., 440-v., double-drum electric hoists. The rope pull is 6,600 lb. and 7,200 lb. respectively. From these points it is hauled to the underground crusher in trains of 85-cu.ft. Granby-type cars drawn by trolley locomotives. The slushers are capable of averaging 150 to 200 tons per scraper-shift per man, depending upon fragmentation and condition of draw holes. In comparison, the production from the bulldozing chambers used during the powder-blasting period averaged 125 tons per shift for two men.

Stoping operations are supervised by the engineering department. After a stope layout has been made by the chief engineer, details as to placement, spacing, and depth of holes are made by the diamond-drill stope engineer, and checked by the chief engineer. This drilling sheet is given to the diamond-drill foreman, who hands it to the drill runner. The work actually accomplished is filled in by the drill operator. The blasting foreman receives a loading sheet which is also prepared by the diamond drill engineer. This shows the number and length of holes, whether they holed through or not, the hole distance to load, and other pertinent information. He subsequently reports the actual work done and the powder used.

The ventilation system is simple and effective. A 350-hp. Aerodyne fan is used, capable of handling 115,000 c.f.m. Fresh air enters the upper levels and descends at the eastern end of the mine through an independent series of ventilation raises. It is then drawn westward along active levels. Fresh air for the slusher drifts comes from a service raise, passing the slusher drift up a ventilation raise into the main exhaust airway in the footwall. At the western end of the mine and adjacent to No. 2 shaft, all levels and crusher stations are connected to a series of ventilation raises extending to the 1,500 level ventilation drift and terminating at the west portal. Here the fan mentioned is installed.

Rock Pressure Developing

Early in 1946, signs of rock pressure began to appear in the mine, particularly between the 1,400 and 1,775 levels. Here, three major stopes were being advanced simultaneously. After investigation, the problem was turned over to P. J. Shenon, consulting geologist, for study. He recommended filling the open stopes with mill tailings, and revising the stoping sequence for future mining on the lower levels. Accordingly, adequate pumping units were installed in the No. 1 tailings area below the mill and at the concentrator proper. These were connected to a 6-in. wood-stave line on the 1,500 level running on to the top of the 1,775 level stopes.

Mr. Shenon's conclusion proved correct: After the 280 stope on the 1,775 level had been filled, rock pressures were arrested to the extent that ore production by blast-hole diamond drilling could be resumed in the 257 and 310 stopes situated on either side of the 280 stope. Under the new mining sequence, stoping is so timed that central stopes are carried through to com-

[1]Since this article was written, long-hole drilling with rock drills, jointed rods and carbide bits has replaced blast-hole diamond drilling.

pletion and filled before ore breakage has advanced too far in adjacent stopes. Above all, production from only one mining level is avoided at all times. Current stoping is done in such a manner that the faces of the stopes, when viewed as a whole, will tend to form an arch, much as a small mine opening tends to arch itself.

Backfilling With Tailings

In filling the 1,775-280 stope mentioned, two plans were employed: No. 1, use of sands mined by hydraulic method from No. 1 tailing area; and, No. 2, use of sand tailings obtained from the concentrator direct. Future filling will involve use of sand tailings from the mill plus an additional tonnage from No. 1 tailing area.

Pertinent stope data are given in Table I. The screen analysis of the material from No. 1 tailing area, after desliming, is as follows: Plus 100 mesh, 24.1%; plus 200 mesh, 40.2%; and minus 200 mesh, 35.7%. The outer edge of No. 1 tailing area consists of a mass of badly oxidized, highly consolidated tailings which proved difficult to break through and finally had to be blasted. Much foreign material, such as coarse gravel, scrap wood and iron, was also encountered.

Sand-filling equipment used includes a sand line made up of a 6-in. 150-ft. head, untreated and coated wire-wound wood-stave pipe with wood-collar couplings, 6-in. I.D. flexible pipe with rubber flange, and standard flange, rubber-lined, welded steel for fitting to the 6-in. wood pipe; one 30-hp. sand pump; four 20-hp. sand pumps; two seal water pumps, one 2-hp. unit capable of delivering 15 g.p.m. against a 170-ft. head, and one 3-hp. unit capable of delivering 15 g.p.m. against a 250-ft. head; and one 21½-ft. deslimer operating at ¼ r.p.m. Water for the hydraulic giant is supplied by a centrifugal pump on the creek. It is driven by a 100-hp. motor and delivers 1,200 g.p.m. against a maximum head of 250 ft. The hydraulic giant employs a ⅞-in. nozzle.

Backfilling has been conducted as follows: Under Plan 1, material removed from the tailing bank by the hydraulic giant was washed to a portable sand pump, passing en route over a grizzly with ¼-in. openings for separating tramp material. The pump delivered through 230 ft. of 10-in. wood-stave pipe to the pumping station below the mill. Here two sand pumps in parallel picked it up and delivered it through 8-in. wood-stave pipes to thickeners in the mill. Percent solids in pulp was controlled by three deslimers, the sands returning to the pump house. From here, the sands were pumped by two pumps through 230 ft. of 6-in. wood-stave pipe to the transfer house in the mill. Transfer to the stope was affected by two sand pumps connected to 3,015 ft. of 6-in. wood-stave pipe. The pump used on Lift 1, driven by a 50-hp. motor, has a capacity of 1,200 g.p.m. (35% solids) against a 60-ft. head. The 20-hp. pumps in parallel on Lift 2 can handle 620 g.p.m. each (35% solids) against a 65-ft. head; the two pumps in series on Lift 3, each using 15.10 b.hp., 480 g.p.m., total head 110 ft. (50% solids); and the two pumps in series on 6-in. line, using 18.75 b.hp., 480 g.p.m., total head 175 ft. (50% solids). The two primary deslimers at the mill are 20 ft. in diameter and 8 ft. high, and operate at ⅓ r.p.m. Spigot discharge from the 21½-ft. secondary deslimer contained from 50 to 54% solids.

During the period May 14 to July 26, 1947, when Plan 1 was in operation, 28,244 tons was handled. Maximum and minimum rate pumped per 24 hr. was 2,155 and 2,040 tons, respectively; maximum and minimum solids pumped, 51.3 and 48.3%; and average solids pumped 48.5%. Total hours pumped was 314.5.

Plan 2 was in operation from Aug. 15 to Dec. 19, 1947. During this time a total of 121,852 tons was handled. About 64% of the total tonnage milled is handled by the two pumps in series that were on Lift 3 in Plan 1. Final transfer underground is accomplished by the two pumps in series on the 6-in. wood-stave line mentioned before.

Plan 2 Pumping Different

Pumping operations, however, differ somewhat from those in Plan 1. Volume handled by the pumps on Lift 3 is 310 g.p.m., head 175 ft., and solids 45%. For the pumps on the pipe line these figures are: Volume, 310 g.p.m., head 175 ft., solids 45%. Pump speeds are 940 and 1,020 r.p.m., as in Plan 1. Maximum and minimum rate pumped per 24 hr. was 1,153 and 1,064 tons; maximum and minimum solids pumped, 47.5 and 41.3%; average solids pumped, 44.8%; and total hours pumped, 2,452. Delays caused by power failure, bulkhead leakage and pump repairs were less than 1% of possible operating time. In Plan 1, delays experienced were caused by plugged pipe lines, bulkhead leakage, plugged thickener and pump repairs.

Underground, the location of the point of discharge to the stope was varied, to give the best composition of fill. Making thick beds of slimes was avoided. Auxiliary control equipment on the 6-in. line leading underground included an automatic float valve at the pumps to control surging, and an automatic valve on the pipe line proper to flush high-pressure water through the line upon failure of the pumps. To seal off openings of the stope to be filled, bulkheads of wood and concrete construction were used. Rock cracks were satisfactorily sealed with gunite. Fill was drained through a pipe inserted through the bulkheads, and through cracks around the concrete bulkheads. Accumulated water was pumped to the 1,500 level by a centrifugal pump. Volume of drainage in Plan 1 was estimated at 290 g.p.m. and 266 g.p.m. in Plan 2. The 1,775-280 stope filled under the two plans still has a slight amount of drainage four months after completion of filling.

A Third Plan for Future

For future filling work Plan 3 will be used. Briefly explained, it calls for:

1. Normal concentrator operations with sands from the recently completed cyanide plant, estimated at 1,400 tons maximum (60%, solids), to be delivered to a pumping station below the concentrator.
2. Hydraulic operations to deliver material from No. 1 tailing area to a 21½-ft. deslimer at the pumping station mentioned in preceding paragraph.
3. Deslimer to deliver sands to the first pumping stage. Maximum 800 tons at 50% solids.
4. Combined sands from cyanide plant and those from No. 1 tailing area to be delivered underground at maximum rate of 2,200 tons per day, at 50% solids.

To H. H. Sharp, president of Howe Sound Co., thanks are due for permission to prepare and publish this article. Grateful acknowledgment for help in gathering the information presented is made to J. J. Curzon, manager of the Chelan Division, and members of his staff, including John Bley, mine superintendent; W. S. Phillips, chief engineer; V. A. Zanadvoroff, mill superintendent; Paul M. Price, ventilation engineer, and E. A. Youngberg, diamond-drill engineer.

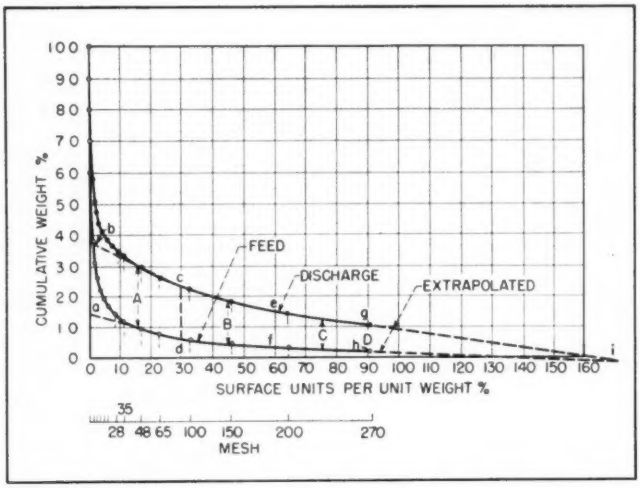


FIG. 1. Cumulative weight percentages, plotted against relative screen-size surface units, permit rapid calculation of new surface produced in grind and of efficiency.

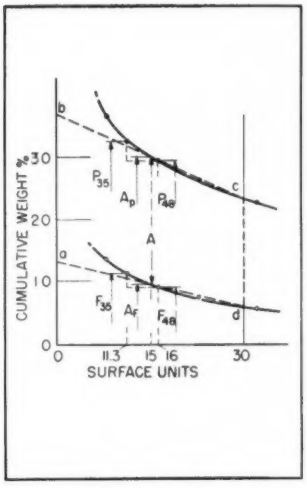


FIG. 2. Detail of graphical basis for direct computation of new surface.

Simple calculations, based on these graphs of screen analyses, make it easier . . .

To Rate Grinding Efficiencies

A. LEGSDIN
Associate Professor of Mineral Dressing, Missouri School of Mines and Metallurgy, Rolla, Mo.
and
FREDERICK L. SCHENCK
Mining Geologist, Rolla, Mo.

SEEKING TO AVOID lengthy computations, we have devised a rapid method of rating efficiencies of crushing or grinding machinery in terms of new surface area produced per unit of power input, for instance, per hp.-hr.

As accurate as any method of surface determination based on screen analysis, this technique takes advantage of the characteristic smoothness of screen analysis curves when cumulative weight percentages are plotted.

Calculation by this method of new surface produced in a grind does not require a graph of the screen analyses, but it is based on that graph and is best understood by developing the graph first.

Given Tyler screen analyses of the feed and of the crushed or ground product, the graph is prepared by plotting cumulative weight percentages along the vertical axis, beginning with the finest size first and by plotting horizontally the surface units present in one weight percent of the material held on each screen. The points for each screen on the horizontal axis are thus marked by numbers expressing surface units in unit weight of the material held on each screen.

For example, to calculate these numbers: Let d equal average diameter of particles retained on the screen (the arithmetic mean of limiting and retaining screen openings). Let D equal weight of unit volume of mineral, and w equal weight of all particles on the screen.

Assuming cubical particles, then weight of one particle equals Dd^3. Surface area equals $6d^2$. Number of particles in w weight units is w/Dd^3. The number of particles in one weight unit is $1/Dd^3$. The surface area of all the particles in unit weight is therefore:

$$6d^2 \times \frac{1}{Dd^3} = \frac{6}{Dd}$$

This calculation gives the surface units characteristic for each screen. If D is in lb. per cu.ft. and d is in ft., then the calculated surface area will be in square feet per pound. Any units may be chosen as long as they are comparable.

Surface calculations from screen analyses are simple if we select as the reference surface unit the surface of unit weight of crushed material retained by a selected reference screen. The surface areas of particles retained on other screens are then computed in terms of the reference surface.

Because the surface areas of equal weights of the same material are inversely proportional to the diameter of the particles, it follows that the surface area of one weight percent of material held on each screen would bear a simple ratio to that held by the next finer screen, owing to the constant screen ratio of the Tyler screen scale. These simplified relative surface units are plotted on the horizontal axis of the graph.

We find it convenient, especially in ball mill grinding tests, to use as references the surface represented by one weight percent of material retained on the 4-mesh screen. Table I gives the data prepared from screen analyses taken from a laboratory ball mill test. The graph prepared from these data appears as Fig. 1.

The 4-mesh screen is chosen as the reference point because in sub-

Table I. Data Computed From Screen Analysis of a Ball Mill Grind of Ore

1 Tyler Screens	2 Relative Surface Per Unit Weight of Ore	3 Cumulative Weight Percent Feed	4 Cumulative Weight Percent Discharge
1.050	0.177	100.0	....
0.642	2.250	92.7	100.0
0.525	0.354	80.2	90.6
0.371	0.500	59.6	69.6
3 mesh	0.707	47.2	57.7
4	1.000*)	37.4	51.0
6	1.414	31.0	46.7
8	2.00	25.9	43.6
10	2.83	21.8	41 3
14	4.00	18.3	39.1
20	5.66	15.8	37.2
28	8.00	13.5	35.2
35	11.3	11.2	32.7
48	16.0	9.3	29.8
65	22.6	7.5	26.5
100	32.0	5.8	22 7
150	45.3	4.4	18.6
200	64.0	3.2	14.6
—200	90.6 (270-mesh)	1.9	10.2

*) Assumed unit surface.

sequent calculation the coefficients for the 200 and 270-mesh screens can then easily be placed on the slide rule. Only when checking performance of very coarse crushers should it be necessary to use a coarser screen as a reference point.

In Fig. 1, the area between the feed and the discharge curves represents new surface produced by grinding. This is expressed in the relative surface units already defined. The curves have been extrapolated as straight lines beyond 270-mesh to allow for the surface of the unsized minus 200-mesh material. This is done to simplify the calculation.

In comparing such graphs from large numbers of tests, it is apparent that certain features are common to all of them:

1. The curves are smooth.
2. Size distribution in both feed and discharge ranges over ten or more Tyler screens.
3. The largest part of new surface produced in a crushed product is on particles 10-mesh and finer. New surface on coarser particles is negligible.
4. In ball mill tests, range of coarsest particles in the feed is between 1½-in. and about 3-mesh.

Referring to Fig. 1, the new surface produced may be estimated by summing the areas of the trapezoids, abcd, cdef, efgh, and the triangle, ghi, 30 units each. Calling the mid-lines of the trapezoids, A, B, and C, and the base of the triangle, D, we have:

$$\text{Area abcd} = 30A$$
$$\text{Area cdef} = 30B$$
$$\text{Area efgh} = 30C$$
$$\text{Area ghi} = \frac{30D^2}{4(C-D)}$$

Therefore, the relative new surface produced, S, is

$$S = 30\left[A + B + C + \frac{D^2}{4(C-D)}\right]$$

where A, B, C, and D are scaled off in the same units as the vertical axis of the graph. We purposely retain the surplus area within trapezoid abcd to compensate partly for the error made in underestimating the surface of the minus 200-mesh material in area, ghi.

The new surface produced can be calculated without constructing a graph. Fig. 1 shows that ordinates A, B, C, and D are the same for all graphs as long as the horizontal scale is unchanged. This is because A, B, and C are the midlines of equal-height trapezoids and D is one side of trapezoid efgh.

Thus for our conditions, the ordinate A is always between the points corresponding to screen 35 and 48-mesh at a fixed horizontal distance from the ordinates for these screens. Therefore, one can compute the length of ordinate A from points on the feed and discharge curve for 35 and 48-mesh screens. Fig. II illustrates such a computation.

Let F refer to cumulative feed percentages, P to cumulative product percentages, and let a subscript indicate the corresponding screen size. Thus, P_{35} is the cumulative weight percent of feed held on the 35-mesh screen.

Now from the conditions shown in Fig. II, it follows that ordinate:

$$A_F = F_{48} + \frac{1.0}{4.7}(F_{35} - F_{48}) = 0.8F_{48} + 0.2F_{35}$$

$$A_P = P_{48} + \frac{1.0}{4.7}(P_{35} - P_{48}) = 0.8P_{48} + 0.2P_{35}$$

$$A = A_P - A_F = 0.8\,(P_{48} - F_{48}) + 0.2(P_{35} - F_{35})$$

All other ordinates can be calculated similarly.

As shown in Fig. 1, ordinate B nearly coincides with the 15-mesh ordinate, therefore:

$$B = P_{150} - F_{150}$$

Ordinate C is midway between the 200-mesh and the 270-mesh screens, therefore:

$$C = \tfrac{1}{2}(P_{200} - F_{200} + P_{270} - F_{270})$$

Ordinate D falls near enough to the 270-mesh ordinate to be considered identical with it.

$$D = P_{270} - F_{270}$$

Thus the value for A, B, C and D can be calculated directly from screen analysis data, and the new surface, S, produced is calculated as follows:

$$S = 30\left[A + B + C + \frac{D^2}{4(C-D)}\right]$$

To illustrate, the new surface produced in the test detailed in Table I is calculated as follows: (The values for P and F are substituted from the table in the foregoing equation.)

$$S = 30\left[20.7 + 14.2 + 9.9 + \frac{8.3^2}{4(9.9 - 8.3)}\right]$$

S = 1,668 surface units.

Wherein, by one surface unit, we mean the surface area represented by one percent by weight of the material retained on the 4-mesh screen.

To express the new surface in terms of surface-tons per hp.-hr., as proposed by Coghill,[1] then the relative surface must be multiplied by tons of ore broken per hour and be divided by the hp. input.

The foregoing formulae will apply to screen analyses on either the single or double Tyler series, provided that the crushed or ground product ranges from minus 200-mesh to at least 14-mesh in size.

[1]Coghill, W. H. *Evaluating Grinding Efficiency by Graphical Methods. Eng. & Min. Jrnl.*, Dec. 15, 1928.

Canada's Future Brightens

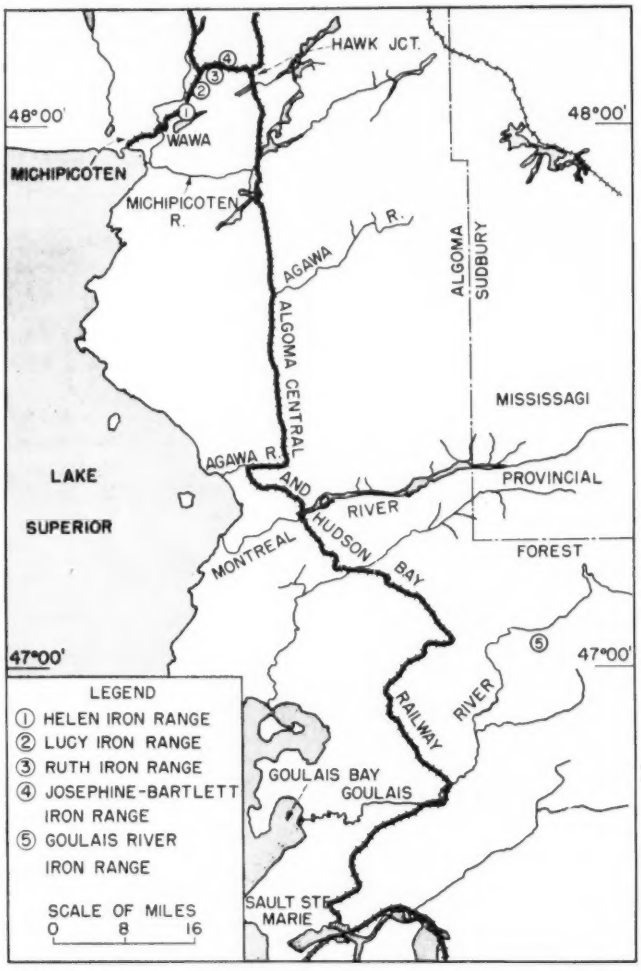
JOHN B. DeMILLE
Consulting Geologist
Montreal

WHILE CANADA now imports about 90% of the iron ore charged to its blast furnaces, the present domestic output of ore, at Steep Rock and in the Michipicoten area, is already at the rate of about 2 million tons a year. A decade ago no iron ore was produced. Since then, Canadian steel output has jumped two and a half times to about 3,100,000 tons—the largest rate of increase of all steel-producing countries. With blast furnace capacity up 40% and an increase of 167% in open-hearth and electric-furnace capacity, the Dominion is now making a bid for great expansion.

Electric Smelting?

Considerable discussion has been aroused by the proposal of two professors at Laval University, Quebec, for processing up to 10 million tons of Quebec iron ore annually by electric smelting at some point along the St. Lawrence River between Comeau Bay and Seven Islands. The latter port, 125 miles northeast of Comeau Bay, is 400 miles from the Sydney coalfield and within 100 miles of the Matane high-grade limestone. The electric smelting of 10 million tons of iron ore would require 2 million horsepower, thought to be available within 125 miles of Comeau Bay. The mineral wealth of Labrador appears destined to change the economy of eastern Canada.

"A great industrial area comparable with any in the United States" has been predicted for the lower St. Lawrence in Quebec by C. A. Durrell, general manager of the Labrador Mining and Exploration Co., Ltd. Mining and shipping facilities, together with a 360-mile railroad, are expected to cost upward of $300 million, following the expenditure of about $5 million for exploratory work since 1936. Out of the projected annual output of 10 million tons of iron ore from the Labrador-Ungava district Canada is expected to use more than 2 million tons, the balance to be exported. James B. Forrestal, while Secretary of Defense in the United States, has said that one of the advantages of the proposed St. Lawrence seaway for national defense would be that it would make available to furnaces in the United States additional source of high-grade iron ore.

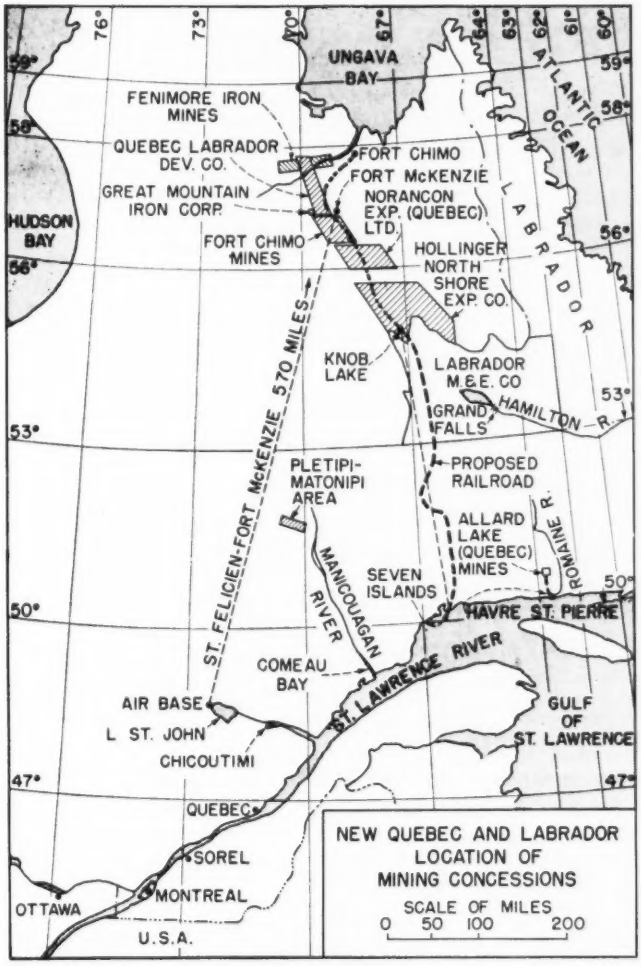


IRON RANGES of Algoma District, rugged wooded region of Western Ontario bordering on Lake Superior-Ontario Dept. of Mines.

The program of the Hollinger-M. A. Hanna interests* that has disclosed at least 300 million tons of premium-quality hematite by scattered drilling to shallow depths along the 70-mile belt in the Labrador trough represents only the most advanced of a number of seriously undertaken exploratory programs in Quebec. Careful attention is being given to the discoveries reported by New Quebec Explorations, Ltd., Fort Chimo Mines (Frobisher, Ltd.), Norancon Exploration, Great Mountain Iron, Quebec Labrador Development, and the Fenimore companies—all in the trough. Another source of iron is disclosed in the projected recovery of iron as a byproduct from 100 million tons of pyrite concentrate at a daily rate

*See "That Labrador Iron Ore," *E. & M. J.*, Nov., 1948, pp. 88-92.

As Producer of Iron Ore



THE IRON ORES of this vast region of Labrador and Quebec will provide the basis for great activity in the future.

of 1,000 by Noranda Mines, Ltd.

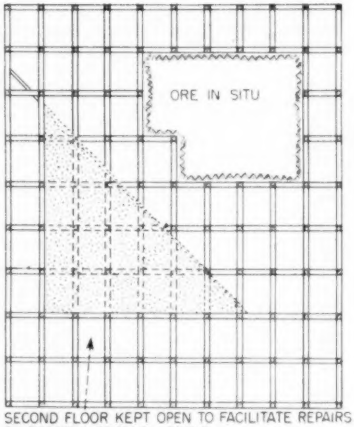
Within the next three years the Quebec Iron and Titanium Corporation (controlled by Kennecott and New Jersey Zinc) will be starting production from the Lake Tio deposits of titanium-bearing iron ore. This year also the Romaine River Railway Co. will finish building its 27-mile line to Havre St. Pierre, on the St. Lawrence, and in 1950 production is to start at a rate of 4,000 tons per day. The electric smelting plant at Sorel, 600 miles southwest, will have a daily capacity of 1,500 tons. Prior to the drilling by Kennecott, Canada's major known deposits of ilmenite-bearing magnetite were those located near Chicoutimi, Quebec, and those on the north shore of Lake Superior.

In western Ontario, $3\frac{1}{2}$ million tons of high-grade hematite has been exported by Steel Rock Iron Mines, Ltd., since 1945 and an increase to about 3 million tons annually within the next three years is planned. Reserves amount to upwards of 72 million tons. The Algoma Steel Corp., which has its plant at Sault Ste. Marie, Ont., shipped an estimated 550,000 tons of siderite in 1947 and plans to increase its output to 1 million tons this year and to 1.5 million in 1950. From its concentrate a million tons of sinter will be produced. The New Helen and Victoria mines are producing up to 3,000 tons per day, with some 400 million tons of ore in sight. At the Goulais magnetite deposit, in Ontario, a reserve of 150 million tons is reported.

In British Columbia, the Minister of Mines recently stated that a number of magnetite deposits are known along the Pacific Coast. The attention of Vancouver interests is being given those on Texada Island, where at least 2 million tons of ore is said to exist. Diamond drilling at Upper Quinsam Lake, on Vancouver Island, has indicated 1,700,000 tons of ore expected to average 60% iron. The Coast Iron Co., Ltd., formed last year, has an order for 50,000 tons to be shipped to the new electric smelting plant at Wenatchee, Wash. Investigations are also being made at Zeballos, where 800,000 tons of ore averaging 67% iron is said to have been indicated. The Consolidated Mining & Smelting Co. is reported to be considering the problem of treating the Sullivan concentrator's huge pile of residues by electric smelting. This would be sufficient to supply a 200-ton electric furnace for 84 years.

Reserves Huge

On the basis of preliminary exploration Canada's reserves of iron ore have been estimated to be about 1.2 billion tons. In addition, there is the 3.5 billion-ton reserve of the Bell Isle deposits in Newfoundland, which is scheduled this year to become the tenth Canadian province. As drilling proceeds along the Labrador trough; in the Pletipi-Matonipi area 200 miles north of Comeau Bay; in Western Ontario's districts of Steep Rock, Michipicoten, and Goulais; and in the coastal region of British Columbia, it is reasonable to expect that the tonnage figures, already established, will increase. The exploration work now under way in the three provinces indicated has as its objective an ultimate production of about 14 million tons per year.



SECOND FLOOR KEPT OPEN TO FACILITATE REPAIRS TO TIMBERS OF MAIN LEVELS

FIG. 1. LAYOUT OF SQUARE-SET STOPE WITH DELAYED FILLING

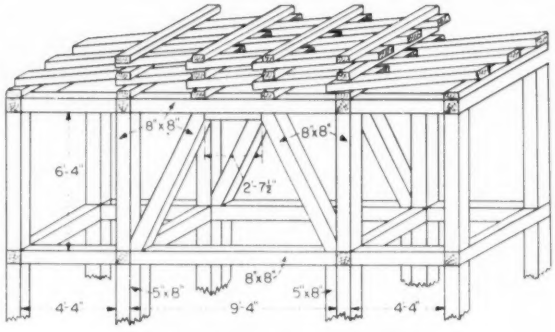
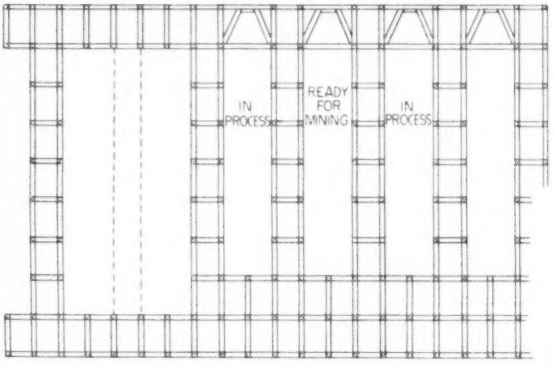


FIG. 2. LONGARINA SET WITH A-BRACES



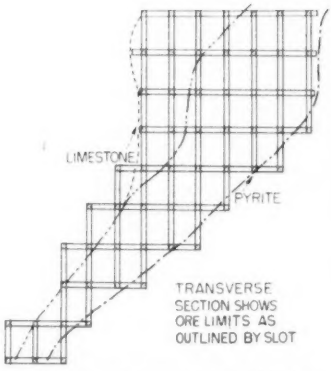


FIG. 3. ARRANGEMENT OF VERTICAL SLOTS AND MITCHELL SLICES IN LONGITUDINAL AND TRANSVERSE SECTIONS

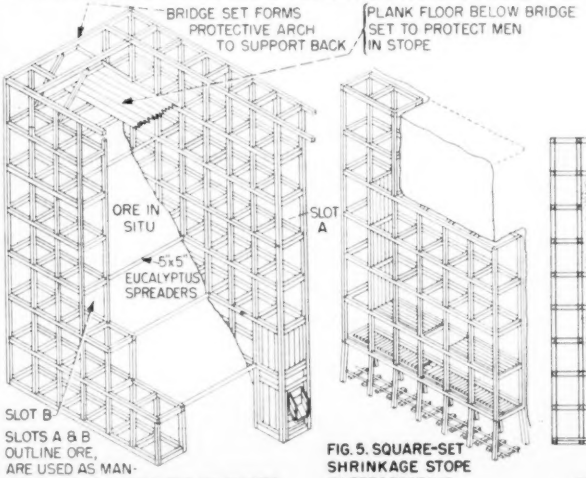

BRIDGE SET FORMS PROTECTIVE ARCH TO SUPPORT BACK
PLANK FLOOR BELOW BRIDGE SET TO PROTECT MEN IN STOPE
ORE IN SITU
SLOT A
5"x5" EUCALYPTUS SPREADERS
SLOT B
SLOTS A & B OUTLINE ORE, ARE USED AS MAN-WAYS AND TO BYPASS ORE TO CHUTES

FIG. 4. MITCHELL SLICE, SHOWING ADJACENT SLOTS

FIG. 5. SQUARE-SET SHRINKAGE STOPE IN PERSPECTIVE

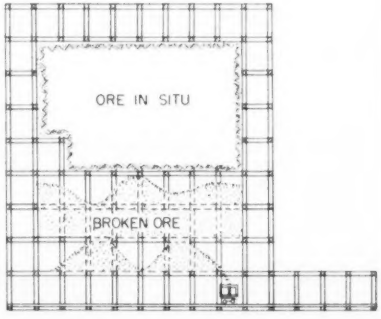


FIG. 6. LAYOUT OF SQUARE-SET SHRINKAGE STOPE, IN LONGITUDINAL SECTION

Survey of Mining Practice*

Mining Method Changes Give Improved Results

Stoping methods are often in a state of change, experimental or dictated by conditions. One of the standard methods thus may exhibit uncatalogued variations. Details are generally important, the success of the application depending on their handling. Recent inquiry disclosed some instances.

Cerro de Pasco

THE OMBLA MINE, at Morococha. Cerro de Pasco's Morococha Mining Department about two years ago decided to substitute a new stoping procedure in its Ombla mine for the old system of longitudinal overhand square-set stoping that had been in use. The latter presented the following disadvantages:

1. In respect to safety—Falls of ground and collapses of timber were numerous, particularly with stopes exceeding 25 sets in area, and even with stopes of smaller area when a limestone roof pendant was approached.

2. In respect to ore delineation —Stope development did not fully delineate the orebodies and much ore was overlooked.

3. In respect to use of timber— The old method required one square set for every 25 tons mined. Timber recovery was dangerous and impractical. With timber increasing in price and hard to get, a method which would economize in its use was desirable.

To meet these disadvantages and increase the output per man from this section, vertical transverse slotting was adopted and subsequently Mitchell stoping of pillars between slots. A variation to reduce slotting is being tried in one stope. Where vein width does not permit Mitchell stoping, shrinking through square sets in stopes of short length has proved successful.

Mitchell stoping and its variations are mainly practiced in the Ombla *manto* cluster of orebodies.

Converging veins in the Potosi limestone on the west limb of the Morochoca anticline, near the 1,000-level horizon, form one large, pyritic, pipe-shaped body of oval section. Around the periphery the chalcopyritic orebodies are found. That is, for descriptive purposes, these bodies are wedged between flat-dipping limestone and the pyrite *manto*. The bodies, at various horizons and positions laterally around the *manto*, vary from a few inches to many feet in width. Mineralization sometimes extends into the limestone and into the pyrite. No very important mineralization has yet been observed in the center of the *manto*. Width and extent of the peripheral mineralization seems controlled by changes in dip and strike of the contacts, and these are unpredictable.

This description will aid in understanding how the new mining methods were developed.

Development of Vertical Slots and Mitchell Slicing. To achieve greater safety and an immediate output increase, the longitudinal stopes of large area were split into smaller transverse stopes three sets wide, leaving intervening pillars two sets wide. This allowed for delayed filling and for building ramps to carry the ore directly to chutes on firing. (See Fig. 1.) When stopes on either side of a pillar were mined out and filled, the pillar was taken out as a Mitchell stope.

Transverse stoping tended to uncover ore which, up to then, had been left in the walls, in both the pyrite and the limestone. This, with the fact that Mitchell stoping was proving successful, suggested vertical slotting at five-set intervals in the newly developed sections. If these slots disclosed cross-sections of a part of the orebody wide enough and suitable for Mitchell stoping, an intermediate slot was run up, leaving pillars two sets wide on either side, which were taken down as a Mitchell stope. (See Figs. 2, 3 and 4.) Fig. 2 is the bridge set over a Mitchell stope.

This method had immediate advantages. Falls of ground and timber collapses were eliminated. Production per man-shift rose by 0.5 ton to 1 ton. The transverse slots gave a complete outline of the orebody in advance of mining and eliminated the possibility of leaving ore in the walls. Unsuspected ore was uncovered.

A further development has been made in the initial stages, to eliminate some of the slots. Sufficient slots are run up to delineate the orebody, generally at 11-set intervals. Then, starting from one slot, a Mitchell stope is taken down and, in place of the other slot, the spreaders are based against a line of half sets which are against solid ore. This line is closed off with scrap timber before the stope is filled, one set of the next block having been taken out to act as a chute. This is repeated along the strike until the next slot is reached. The last block is taken out as a normal Mitchell stope. This method, if successful, will result in even greater timber savings than with the Mitchell stoping, also in savings in development footage. To reduce subsidence of timbers left in these stopes, a change was made from cap-butting to post-butting sets. Its success is yet to be ascertained. When the first Mitchell stopes were filled, the timbers left (timbers which formed the slots and could not be recovered) sunk as much as 4 ft. Although in the Mitchell stopes this caused little bother, in the recent experimental stoping method to eliminate some of the slotting, such subsidence would jeopardize the method's success. It is expected that the post-butting sets will not subside on filling as much as cap-butting sets.

Square-Set Shrinkage Stopes. When the vertical transverse slots show the orebody to be less than three sets wide, the ore is mined by shrinking through the square sets (see Figs. 5 and 6). The walls of the orebodies around the *manto* are never strong enough to allow open shrinkage stoping, even where the ore is narrow. Should the walls become very bad during

(*Continued on page 98*)

*Material here presented is part of that omitted from Parts I and II of the Survey of Mining Practice published in E. & M. J. for February and March respectively.

FIRST-AID COMPETITIONS are held every year at the gold mines of the Rand. Thousands of natives are members of the teams. Native spectators are as critical as the examiners, applauding good work and finding fault with poor whenever the occasion presents itself.

"Safety First" on the Rand

A stiff mining code, plus training and education of white and native workers for accident prevention, have resulted in a lowered accident rate.

J. M. LAWLESS
McGraw-Hill World News
Johannesburg
South Africa

ELABORATE PRECAUTIONS are taken by the mining industry in South Africa to prevent deaths and accidents and to encourage safety measures. The low fatality rates at the gold mines of the Witwatersrand, the biggest employers of mine labor in the Union, compare favorably with those in many other mining countries where only European or white labor is employed and the depths are shallower. South Africa's safety problems are increased by the employment of large numbers of natives in the mines, most of whom are uneducated and are available for approximately a year or so before returning to their homes.

A SHIELD that is awarded annually for the lowest underground accident rate achieved during the year.

The result is a fairly large labor turnover. There is some compensation, however, in the fact that many of these mine workers come back to the mines after, say, six or nine months at their homes. The operators thus get a fair percentage of experienced workers.

Despite these difficulties, the accident-death rate on the Rand has been reduced from 5.26 per 1,000 in 1909 to the record low figure of 1.36 in 1947. This is for 45 producing mines, extending over a distance of about 100 miles.

The Rand gold operators may be regarded among the world pioneers of the safety movement in industry. In 1913 they agreed to form the Prevention of Accidents Committee, consisting of representatives of the Government, the big mining firms, the Chamber of Mines, the Association of Mine Managers, Association of Mine Medical Officers, the South African Institute of Electrical Engineers, and the Rand Mutual Assurance Co., Ltd. With the last the mining companies insure their employees against risk

TREATMENT for a minor injury is given a winch boy by a native assistant in a first-aid station at one of the gold mines.

A POSTER distributed by Prevention of Accidents Committee. "Look out, you fool," say the words at top. Original is 17x22 in.

Pays Dividends

of death, permanent disablement, or temporary disablement caused by accidents arising out of and in the course of their duties.

The main objectives of this committee are to give leadership in the organization of mine-safety campaigns, to stimulate interest in preventing accidents, and to investigate devices that will eliminate, as far as possible, personal factors in accidents. It also disseminates information on devices, ideas and methods of production likely to help reduce the accident rate.

The Committee's axiom is: "Accidents do not just happen; each arises from a definite cause and most of them can be prevented." The reduction of the accident death is a measure of the committee's success, especially in view of the larger number of mine workers employed today, and the difficulties and risks of mining at greatly increased depths.

Subcommittees deal with technical aspects, such as safety devices and ideas, and recommend them to managers for adoption, if approved. Some of the subjects dealt with last year are: Electric blasting in sinking shafts, frozen explosives, shin protection, boot-stretching machines, prevention of misfires, hand fire extinguishers, explosives containing anthracite as an absorbent, electronic signaling, devices for stopping runaway cages, electrocution and unusual accidents.

There is also a publicity subcommittee, which deals with posters, films and other propaganda media.

Government Is Interested

At the same time, the Government takes an active interest in the gold mines that produce the golden eggs of revenue. Its regulations are designed to prevent and reduce accidents, and to deal with special rules for mines and mining operations. There is a Minister of Mines in the Cabinet, and a Government Mining Engineer's Department. Among other duties the latter supervises and sees that the regulations are observed, holds inspectors' courts for breaches of regulations, and generally concerns itself with health and safety matters.

The code is probably the stiffest in the world. It has played an important part in reducing the number of deaths and accidents. Mine owners, managers, surface and underground workers have to conform to nearly 350 detailed regulations laid down in the Mines, Works and Machinery Regulations, as well as local regulations to suit individual mines. The operative statute is the Mines and Works Act No. 12 of 1911, which has been amended from time to time. The regulations have also been amended to meet new situations and developments.

Responsibility in South African mines is on the military or line type. The manager of every mine is responsible for the control, management and direction of his mine. He can, and does, delegate his authority down the line to underground managers, mine captains, shift bosses, miners and other officials.

Supervision of all mines and works and machinery, and the enforcement of the regulations, are exercised by the Government Mining Engineer, who in turn delegates authority to Inspectors of Mines, Machinery, Explosives and other officials appointed for the purpose. To do this, they may enter mine or works and inspect any part of them

at any time of the day or night, provided they do not impede or obstruct the working of the mine or the carrying on of the works.

Provision is made for the punishment of contraventions of statutory or local regulations. A special Mining Court has been in existence since April 3, 1934, to deal with infringements of the laws and regulations. During 1946, for instance, there were 125 prosecutions in the Court, 101 of them successful.

The act also stipulates the penalties that may be imposed, or conviction, for breaches of regulations, obstruction of officials, and obtaining various certificates by fraud. Heavier penalties are stipulated where contraventions imperil safety or cause death or injury.

Miners are warned for minor infractions of rules. Repeated breaches and gross carelessness are reported for action either by the manager or inspector of mines. Minor breaches may also involve fines imposed by managers, the proceeds of which go to charities. Native workers are not fined. Serious breaches are reported to inspectors of mines, who hold inquiries at which evidence is recorded and fines are imposed, if necessary.

Penalty Can Be Stiff

The maximum penalty for obstructing officials is a fine of £150, or 12 months imprisonment with or without hard labor. Obtaining certificates by fraud, £75 or six months hard labor and the cancellation of the certificate is the penalty. Breaches of regulations or failure to comply with notices or instructions may involve a maximum fine of £150, or 12 months hard labor.

Where any act, omission or contravention of the Act or regulations imperils safety, the maximum fine is £250 or 12 months hard labor; where serious bodily injury is caused £500 or 12 months; where death is caused—£1,000, or two years hard labor or such imprisonment without the option of a fine.

The offender may also be prosecuted under the common law, or any other statute, and severer penalties may be imposed. Mere prosecution under the Mines Act does not prevent these other prosecutions. The records of inquiries held by inspectors are sent to the magistrate of the district or the special magistrate of the Special Mining Court. If a miner is dissatisfied with the inspector's verdict, he can appeal to the magistrate, whose decision is final. Recently, in a magistrate's court, a Rand miner was fined £12 10s. ($50) or 14 days imprisonment at hard labor for allowing a native worker to charge holes in a mine.

A mine manager may make special rules for the maintenance of order or discipline, and the prevention of accidents on his particular mine. After approval by the Minister of Mines, these rules, when posted, have the same effect as the statutory regulations. Failure to comply makes the offender liable on conviction to a fine of £5, or 14 days imprisonment with or without hard labor. Inspectors of Mines, Machinery or Explosives may try any breach of regulations or local mine rules unless death has occurred as a result of a breach. The regulations outline the procedure to be adopted.

Regulations Comprehensive

The statutory regulations are divided into 30 chapters, and they deal with surface and underground protection, hoisting, traveling and ladderways, ventilation, lighting, explosives, duties of miners, blasting, etc., underground contract work, workmen, responsibility in mine and works, and general safety measures for machinery, accidents, inquiries and the issue of certificates.

Although there has been greater mechanization in South African mines in recent years, the proportionate death rate from machinery accidents has changed very little, due mainly to increased care and control of all machinery. In 1946 it was 2.36% of the total deaths at the mines.

According to official reports, about 75% of fatal accidents and 97 to 97.5% of non-fatal accidents at the Rand mines are due to dangers inherent in the work or to misadventure.

Mondays, 9-11 A.M., Worst

Observations of one Inspector of Mines on the East Rand showed that over a year the peak period for accidents in all mines was from 9 A. M. to 11 A. M., and that the largest number of accidents occurred on Mondays.

Accidents increased gradually in number from the beginning of a shift to such peak period, and thereafter the number was reduced at a uniform rate. The period 9-11 A. M. the inspector observed, was the busiest part of the shift, with a maximum number of people underground and work in full swing. Monday might be regarded as the most likely day of the week for accidents to occur from a psychological point of view and from the fact that the workings had remained idle during the week-end.

Getting the Message Across

Because of involved legal phraseology, and to help miners understand what the regulations are all about, the Prevention of Accidents Committee issues extracts and digests to cover all relevant operations. These are so simple that anyone can understand them. Here is one example: Regulation 96 (1) says: "While carrying explosives other than detonators, safety fuse, and fuse igniters underground, unless such explosives can be contained in unopened cases, no person shall carry any light, unless it is a safety lamp, or, in a non-fiery mine, an enclosed light, but immediately in front of the explosives a person shall go with a light, and it shall be his duty to give proper warning of the approach of explosives."

The digest version is simply: "Carry a light in front of explosives and give proper warning."

All underground workers are also kept informed of the regulations by supervisors and posters. Talks are given to natives in their compounds.

Safety Before Cost

The mine operators themselves choose the safest methods of mining, both generally and in detail, with saving in cost being a secondary consideration. If methods are found to be the best in the circumstances, the details are clearly set out and all miners have to adhere to them. The desire of the operators to promote safety in the industry led them in the first place to establish and support the Prevention of Accidents Committee.

In the mines, white recruits are always put alongside experienced men. Apprentices attend the Government Miners' Training School, branches of which are scattered over the Rand. Here they are thoroughly trained in various underground operations. Senior mine officials hold oral examinations at the end of their courses and, if the recruits are successful, they are awarded diplomas. The safety aspect is emphasized throughout training. Since July, 1946, every apprentice must acquire a first-aid certificate at some time during the

first two years of his indenture. Some indentures last as long as 624 shifts (about 2½ years), but if their work and conduct are good, apprentices may be released from indenture after 468 shifts.

Three-quarters of the cost of running the school is borne by the Chamber of Mines, and the remainder by the Government. The latter, however, pays two-thirds of the capital expenditure. The Chamber bears the rest.

Training of Natives

Native mine workers are put through special training schools where they learn all about stopes, drives, hanging, timbering, shoveling broken rock and tramming, long before they see the inside of a mine. Some properties have artificial mines on the surface, which contain model stopes correct in every detail, different types of supports and the rock itself. Some of the instructors are selected native boss boys, who also teach the recruits the *lingua franca* of the mines. This is called "Fanakalo." It is a synthetic language devised to enable the native worker of many tribes, speaking 50 different dialects, to understand each other and to understand the white miners' instructions.

Fanakalo (meaning "like this") is a sort of mine Esperanto. It is a development from so-called "mine Kaffir." In recent years some white miners and native boss boys got together and gave the latter synthetic language an up-to-date vocabulary and its new name. The origins of its words are English, Afrikaans and various native dialects, with a Bantu twist to those derived from English and Afrikaans.

The Prevention of Accidents Committee has issued a Miners Companion in English, Afrikaans, Sesuto (a native language) and Fanakalo. Besides a vocabulary, phrases are prepared for miners in different operations, such as drilling, machine work, shoveling, tramming and mechanics.

In these surface schools, the native recruits are also taught personal hygiene, general safety measures, how to wear boots and protective clothing, compound routine and the procedure for lodging complaints.

The keynote of all training is *Safety First*. One demonstration to emphasize the danger of playing and meddling with explosives is to show what happens when a detonator explodes in the hand. (The hand employed in the test is a clay model.)

The industry has found that this preliminary training results in a better understanding of the actual work underground and in low accident rates.

All accidents, including minor injuries, in the gold mines must be reported. There is a great need for qualified persons who can give first aid until a doctor arrives or until injured persons are given medical attention on the surface. Thus a large organization in first aid has been built up. Introduction of first aid has probably been the most important factor in reducing accidents in the mines, especially among the natives.

The Red Cross Society cooperates with the mines in holding classes for miners, European and native, who want to obtain certificates. Lectures are given by medical men, and practical instruction by mine ambulance officers and other qualified men. The natives are very keen about first aid. In 1947, 38,320 of them qualified out of a total of 50,000 employed. Since 1936 more than 302,000 individuals have been trained.

Competitions Excite Interest

To stimulate interest, competitive demonstrations are held among teams at each mine and between mines. In 1948 competitions for natives started on Feb. 8 and continued to the end of May. A record number of 2,049 teams (or 10,245 individuals) competed, compared with 1,948 teams in 1947.

Championship silver and bronze medals are given by the Committee to members of winning teams, subject to certain conditions. Badges are presented to members of all teams taking part, including medal winners, and cash prizes. The South African Red Cross Society (Transvaal Branch) designed the medals, which are highly prized by the natives who put them on their working clothes. The competition year is stamped on them, so that a native who has competed for some years will be decked out like a Christmas tree when he has them all pinned on. Wearing medals also helps their superior officers, as they can easily distinguish trained first-aiders in a mine when wanted to give assistance.

Natives receiving first-aid certificates are paid 2d. a shift (about 3 cents) extra during the three-year validity of the certificates. This costs the industry about £100,000 a year.

The Prevention of Accidents Committee has published an illustrated volume on first aid, giving instructions not only in English, but in Shangaan, Xosa and Sesuto. The photos are all of natives, which adds to the book's attraction. It was written by the late H. T. Bunt, M.D., and revised by A. Frew, M.D., and has attracted much attention in other countries. Copies have been published in the languages used in Southern Rhodesia, Northern Rhodesia, East Africa, as well as the Malay States. The illustrations are those of the workers in the relevant territories.

The competitive spirt is particularly strong among European miners, who have their first-aid contests later in the year. Every underground official must, within six months of engagement, become the holder of a first-aid certificate (or its recognized equivalent). This the regulations require to be renewed at intervals of not more than three years.

Inter-Mine Contests Held

There are also inter-mine safety competitions, based on fatality rates only, and for which prizes are awarded. Since 1945, mine managers, whose mine teams are not prize winners in the inter-mine safety contests, have been asked to recommend approximately 15% of the underground officials for recognition by the Committee. Such officials, below the rank of underground manager, receive inscribed mementos similar to those awarded to the winners of the inter-mine competition. They include cigarette boxes, watches and beer mugs with the Committee's emblem. Since Jan. 1, 1948, mine managers have been asked to recommend another 15% of underground employees for inclusion as prize-winners. Only those mines holding local contests are allowed to compete in the prize scheme.

The Committee also stimulates interest in the safety movement and contests by publishing a monthly magazine "Reef." This is distributed free to as many underground European workers as possible, particularly to married workers. At prize-givings and similar functions, the Government Mining Engineer often attends in person, as well as the heads of the mining groups concerned.

Propaganda on safety is also carried into the compounds, where the native workers eat, sleep and relax. Broadcast talks are given

daily on accidents and their prevention, interspersed with musical and other entertaining items. Films are shown in the native compounds every week.

In addition to films with a Wild West theme, or featuring Joe E. Brown and Charlie Chaplin (two favorites), the natives see films on safety, some of the native actors coming from the mines themselves. They are popular, and often have to be shown twice to satisfy audiences. Analogies are drawn of animals; a snake is as dangerous as a misfire (dangerous to handle). Short stories are also told emphasizing dangers and how to prevent them. Bad hanging, blood poisoning, detonators, and similar subjects are dealt with.

Posters are also issued for display on bulletin boards, located where workers congregate, such as shaft heads, change houses, pay offices and mine compounds. The Prevention of Accidents Committee found it good psychology to emphasize the stupid, dangerous type of worker in films and posters by making him appear wearing a checked shirt. See poster, p. 95.

Regulations Comprehensive

The mine regulations promulgated by the Government also deal comprehensively with the treatment of injured persons in mines, the organizations to deal with major accidents, like fires, and the equipment to fight fires. They stipulate the minimum first-aid equipment that must be supplied in every mine; they deal with the provision of ambulances, ambulance officers, rescue brigades and first-aid requirements of officials. Each main traveling shaft has an ambulance officer attached to it.

Some mines provide more than the minima required; they have fully-equipped ambulance rooms, and some of them are even equipped for performing surgical operations.

All the gold mines have "proto" teams. These are fully-trained and equipped rescue squads capable of dealing with almost any type of mine operation. In major accidents like fires, proto teams are called in from other mines. Recently, every mine on the Reef sent such a team to help extinguish a fire which burned for more than a fortnight in a stoped area in Luipaardsvlei mine on the West Rand.

On the mechanical, electrical and working side of a mine, the regulations deal with the various steps to be taken to achieve safety in shafts, cages, skips, hoisting and rope testing. They also say what must be done to minimize the effects of overwinding.

From the Government right down to the rawest, uneducated, native recruit, the spirit of "Safety First" runs through the gold mining industry, and it pays dividends. Its better to be safe than sorry.

Changed Mining Methods (*Continued from page* 93.)

the mining of these stopes, the ore is withdrawn and the stope filled to the back. The rest of the block is then taken out with normal square-set methods and slushers, the fill being kept to within one set of the back. Mostly the walls remain in good condition throughout the stope life, even to the extent of allowing timber recovery while filling.

The foregoing notes were prepared by R. S. Bemis, superintendent of Morococha mine; I. R. Quirk, assistant superintendent, and their staff.

At Yauricocha. During 1948 Cerro de Pasco's Yauricocha mine went into production using square sets in underground mining and glory holes on surface, according to C. S. T. Farish, general mine superintendent. Since the ore is relatively soft, a Caterpillar bulldozer is used for both stripping and ore extraction.

The ore is transported 9.65 miles from mine to railroad by a monocable aerial tramway. The unusual feature of the tramway is the two suspension systems over deep canyons. One is 2,170 ft. long, the other 3,290 ft. The main supports are twelve 1-in. cables supported on 150-ft. towers. There is a catwalk on each suspension supported by two 1-in. cables with six ½-in. handrails (cables). Sway is prevented by a system of 1-in. cables held in concrete anchorages. The sheaves over which the moving cables travel are supported by square frames, four on the short span and seven on the long span. The frames are 4 ft. square by 40 ft. long.

Britannia Beach. Square-set slot raises are driven at 100-ft. intervals and the block of ore between slots is mined by blast-hole drilling from square sets, scraping and filling. This is repeated for every 20-ft. lift. The property is in British Columbia.

Pamour Porcupine. This Ontario gold-mining company is adopting a "shrink-scrape" system in its narrow shrinkage stopes, according to J. R. Harrison, chief engineer. Overbreak is pulled through mill holes located at proper scraping interval, the rest remaining as inactive fill until the stope is completed. All the ore is then pulled through standard chutes, starting at one end. This procedure was adopted to minimize sloughing from footwall and hanging wall. No results are yet available.

New Park. In narrow, vertical stopes on this Utah company's Pearl fissure, the walls are not strong enough for shrinkage stoping. Instead, a "timbered shrink" method has been used. To economize on timber, round posts of native wood are split in half and the flat side is placed against the walls. Caps are 8x8-in. with a 4x6-in. piece of native wood as a collar brace or spacer. Thus good support is obtained at a minimum expense for timber.

Day Mines. In passing, it is noted that in its Tamarack mine, this Idaho operator is changing from rill stoping to horizontal cut-and-fill. In its Sherman mine, the change is being made to horizontal cut-and-fill from open square sets.

Iron Country. Increasing use is being made of block caving by a Marquette Range operator. The objective, of course, is a lower cost of mining underground ore. A new design of grizzly sub to increase safety in drawing is being tried.

Mount Isa. Stoping by ring drilling of blast holes by diamond drills was pioneered in Australia by this Queensland operator. At present most of the ore is broken in transverse vertical slices by fans drilled downwards from sublevels. Drilling of parallel blast holes is under test. The ore is drawn through grizzlies, and scraper drifts are being tested in this operation.

MARKETS—Trends and Prices

"Disinflation" Hits Major Non-Ferrous Metals—Lead Off 4½c. Per Pound—Copper and Zinc Prices Lowered

As March ended most sellers of non-ferrous metals became convinced that the postwar corrective movement in prices was at hand and the shift from a sellers' to a buyers' market was on in earnest. The month witnessed a complete reversal in the buying mood. Competition in moving finished products has been increasing since the turn of the year and is expected to continue. The E. & M. J. index of non-ferrous metal prices declined from the peak of 185.75 in February to 179.31 in March, the first downward revision since July, 1947. During the war years, operating under fixed prices, the index held at 88.74. The Federal Reserve Board's seasonally adjusted index of industrial production declined in February for the third consecutive month to 189% of the 1935-39 average, which compares with the high of last October of 195%.

A gradual easing in the demand for lead, following two months of liberal offerings from domestic and foreign sources, caused buyers to question the ability of producers to maintain the 21½c. quotation much longer. On March 8, the American Smelting & Refining Co. reduced its quotation for lead 2c. per pound, establishing the New York market at 19½c. Consumers, who earlier in the year were scrambling for the metal, pulled out of the market completely, except for some average price business, and the quiet that followed on the heels of this announcement was almost without precedent. Consumers who sensed that the price structure in lead was weakening not only refrained from buying but engaged in a frantic effort to reduce their inventories. Two subsequent reductions in the price of lead, that dropped the quotation down to 17c., failed to stimulate business. Though lead was generally viewed as the most vulnerable of the major non-ferrous metals, the decline in the price nevertheless had a profound influence on the entire market. Both copper and zinc became inactive and before the month ended these metals also developed price weaknesses. Scrap prices were sharply lower.

Battery Sales Slump

Much was made of a drastic contraction in business in replacement storage batteries for automobiles, an important outlet for lead. Trade statistics revealed that replacement battery shipments in February totaled 821,000 units, which compares with 1,243,000 units in January and 2,254,000 units in February a year ago. The mild winter in the Eastern States was given as the main cause of the slump sales. Out of a total of 1,071,195 tons of primary and secondary lead consumed in this country during 1948, the battery industry absorbed 322,238 tons.

Announcement by A. S. & R. that it would discontinue its "published" lead quotation, effective April 1, attracted wide interest. The announcement follows:

"The American Smelting & Refining Co. quotation has in the past been used as a basis for settlement for ore and other lead-bearing materials purchased at A. S. & R. plants, and also for determining the price which consumers pay for lead purchased from the company under continuing contracts.

"Beginning April 1, 1949, contracts for the purchase of ores and other lead-bearing materials made by A. S. & R. will be based on the quotation for lead at New York as determined by the Engineering and Mining Journal. Continuing contracts covering the sale of metal will be based on this quotation, or quotations appearing in other established trade papers."

That copper should have developed weakness at this time came as a surprise to most primary producers. The statistics pointed to a steady price situation for the next two or three months and most operators did not regard the 23½c. price as over-inflated under prevailing abnormal conditions. The stockpile, it was argued, would absorb surplus metal should the trend in consumption turn downward. However, the movement of scrap to custom smelters increased appreciably and prices on this material dropped sharply. The intake of scrap proved larger than anticipated. After independent or unaffiliated consumers decided that they would hold off from making additional purchases, pending further developments, supplies began to accumulate. During the last week of March it became known that A. S. & R. offered fair tonnages of copper to domestic consumers at concessions from the 23½c. basis. In the absence of any business in the open market at the higher level, offerings on the 23¼c. basis had to be recognized in establishing the E. & M. J. quotation for the last two days of the month. As in lead, the decline brought the market to a standstill, except for some inter-company business. As the month ended it was also reported that foreign copper could have been obtained at the equivalent of 23¼c., f.a.s. New York.

Statistics compiled for the fabricating division of the copper industry showed that apparent consumption for February was 94,224 tons, against 111,551 tons in January. Stocks of copper in the hands of fabricators increased slightly during February to 367,872 tons. Production of refined copper in the United States during February totaled 80,275 tons, against 78,298 tons in January. With output in Utah increasing domestic mine output is scheduled to improve over the second quarter of the year.

Copper Duty Suspension

President Truman, on March 31, signed the bill extending the suspension of the import duty on copper until

Manganese Ore in 1948

(U.S. Bureau of Mines)

Net supply of manganese in terms of ore during 1948 was estimated at 1,528,806 short tons, of which 130,000 tons was domestic. This compares with 1,781,246 tons in 1947, of which domestic sources supplied 131,627 tons. Net supply consists of domestic shipments, general imports of ore and ferromanganese (in terms of ore) minus exports of ore and ferromanganese.

General imports of manganese ore, 35% or more of Mn, during 1948, in short tons:

Country	Battery		Other		Total	
	Gross Weight	Manganese Content	Gross Weight	Manganese Content	Gross Weight	Manganese Content
Angola	...	...	2,608	1,408	2,608	1,408
Belgian Congo	2,128	1,085	561	286	2,689	1,371
Brazil	...	...	143,916	57,955	143,916	57,955
Canada	...	...	348	176	348	176
Chile	672	336	10,171	4,537	10,843	4,873
Cuba	684	355	32,159	15,213	32,843	15,568
France	...	...	1	1	1	1
French Morocco	...	...	300	166	300	166
Gold Coast	68,053	38,376	64,918	31,930	132,971	70,306
India	1,707	796	211,738	102,420	213,445	103,216
Mexico	136	55	61,478	27,731	61,614	27,786
Philippines	560	302	9,560	4,797	10,120	5,099
Portuguese Asia	...	...	1,109	455	1,109	455
Turkey	...	...	33	18	33	18
Union of S. Africa	...	...	216,576	98,513	216,576	98,513
U. S. S. R.	8,950	4,923	418,280	196,488	427,230	201,411
Total	82,890	46,228	1,173,756	542,094	1,256,646	588,322

MARKETS—Trends and Prices

June 30, 1950. The House had previously voted for a two-year extension of the measure, but the Senate cut down the period to one year. House and Senate conferees compromised on an extension of 15 months.

Zinc was in demand up to the beginning of March. The decline in lead set off a more cautious buying policy in both Prime Western and Special High Grade. Galvanizing operations continued at a high level throughout the period, but leaders in the industry now take the stand that a tapering off in production of most steel products is in the making, which would involve galvanized sheet and other galvanized products. Weakness in steel scrap appeared to point to a change of pace. The automobile industry continued to absorb large tonnages of die-casting alloy, but other lines, as household appliances, etc., have cut down on their requirements which has reduced the call for Special High Grade. Increased competition in zinc caused some sellers of Special High Grade, who had been demanding a premium of 1¼c., to reduce the spread to 1c. As the month ended Prime Western was unsettled at 16c. per pound, East St. Louis, a decline of 1½c. from the price that prevailed up to March 23. The price change in zinc was the first since last November.

Allocation order M-112, which controlled receipts and consumers' stocks of antimony, has been revoked by the Office of Domestic Commerce. Increased supplies and reduced consumption make its retention unnecessary. The price situation in antimony is easing, with Chinese metal available at 38c., New York.

Tin was unchanged. Production continues to expand. The visible supply of pig tin in the hands of the Government at the end of February amounted to 25,199 long tons, against 23,929 tons a month previous. Consumption in February was held down to less than 4,000 tons.

Quicksilver was unsettled on fairly liberal arrivals from Japan.

Major Metals

U. S. DAILY AND AVERAGE PRICES

Mar. 1949	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc East St. Louis
1	23.200	23.425	103.000	21.500	21.300	17.500
2	23.200	23.425	103.000	21.500	21.300	17.500
3	23.200	23.425	103.000	21.500	21.300	17.500
4	23.200	23.425	103.000	21.500	21.300	17.500
5	No Market	23.425	103.000	21.500	21.300	17.500
7	23.200	23.425	103.000	21.500	21.300	17.500
8	23.200	23.425	103.000	19.500	19.300	17.500
9	23.200	23.425	103.000	19.500	19.300	17.500
10	23.200	23.425	103.000	19.500	19.300	17.500
11	23.200	23.425	103.000	19.500	19.300	17.500
12	No Market	23.425	103.000	19.500	19.300	17.500
14	23.200	23.425	103.000	18.000	17.850	17.500
15	23.200	23.425	103.000	18.000	17.850	17.500
16	23.200	23.425	103.000	18.000	17.800	17.500
17	23.200	23.425	103.000	18.000	17.800	17.500
18	23.200	23.425	103.000	18.000	17.800	17.500
19	No Market	23.425	103.000	18.000	17.800	17.500
21	23.200	23.425	103.000	18.000	17.800	17.500
22	23.200	23.425	103.000	18.000	17.800	17.500
23	23.200	23.425	103.000	18.000	17.800	16.000
24	23.200	23.425	103.000	18.000	17.800	16.000
25	23.200	23.425	103.000	18.000	17.800	16.000
26	No Market	23.425	103.000	18.000	17.800	16.000
28	23.200	23.425	103.000	17.000	16.850	16.000
29	23.200	23.425	103.000	17.000	16.850	16.000
30	22.950	23.425	103.000	17.000	16.800	16.000
31	22.950	23.425	103.000	17.000	16.800	16.000
AVERAGES FOR MONTH						
Mar.	23.178	23.425	103.000	18.907	18.715	17.056
AVERAGES FOR WEEK						
Mar.						
2	23.200	23.425	103.000	21.500	21.300	17.500
9	23.200	23.425	103.000	20.833	20.633	17.500
16	23.200	23.425	103.000	18.750	18.567	17.500
23	23.200	23.425	103.000	18.000	17.800	17.250
30	23.150	23.425	103.000	17.500	17.317	16.000
CALENDAR WEEK AVERAGES						
Mar.						
5	23.200	23.425	103.000	21.500	21.300	17.500
12	23.200	23.425	103.000	19.833	19.633	17.500
19	23.200	23.425	103.000	18.000	17.817	17.500
26	23.200	23.425	103.000	18.000	17.800	16.500

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

Mar. 1949	Sterling Exchange "Checks"	Silver (c) New York	Silver London	Gold London	Gold (d) United States
1	402.750	71.500	43.500d.	172s. 3d.	$35.00
2	402.750	71.500	43.500d.	172s. 3d.	35.00
3	402.750	71.500	43.500d.	172s. 3d.	35.00
4	402.750	71.500	43.500d.	172s. 3d.	35.00
5	(e)	(e)	(e)	(e)	35.00
7	402.750	71.500	43.500d.	172s. 3d.	35.00
8	402.750	71.500	43.500d.	172s. 3d.	35.00
9	402.750	71.500	43.500d.	172s. 3d.	35.00
10	402.750	71.500	43.500d.	172s. 3d.	35.00
11	402.750	71.500	43.500d.	172s. 3d.	35.00
12	(e)	(e)	(e)	(e)	35.00
14	402.750	71.500	43.500d.	172s. 3d.	35.00
15	402.750	71.500	43.500d.	172s. 3d.	35.00
16	402.750	71.500	43.500d.	172s. 3d.	35.00
17	402.750	71.500	43.500d.	172s. 3d.	35.00
18	402.750	71.500	43.500d.	172s. 3d.	35.00
19	(e)	(e)	(e)	(e)	35.00
21	402.750	71.500	43.500d.	172s. 3d.	35.00
22	402.750	71.500	43.500d.	172s. 3d.	35.00
23	402.750	71.500	43.500d.	172s. 3d.	35.00
24	402.750	71.500	43.500d.	172s. 3d.	35.00
25	402.750	71.500	43.500d.	172s. 3d.	35.00
26	(e)	(e)	(e)	(e)	35.00
28	402.750	71.500	43.500d.	172s. 3d.	35.00
29	402.750	71.500	43.500d.	172s. 3d.	35.00
30	402.750	71.500	43.500d.	172s. 3d.	35.00
31	402.750	71.500	43.500d.	172s. 3d.	35.00
AVERAGES FOR MONTH					
Mar.	402.750	71.500	43.500d.	—	35.00
AVERAGES FOR WEEK					
Mar.					
2	402.750	71.500	—	—	
9	402.750	71.500	—	—	
16	402.750	71.500	—	—	
23	402.750	71.500	—	—	
30	402.750	71.500	—	—	

Calendar week averages, New York Silver: Mar. 5th, 71.500; 12th, 71.500; 19th, 71.500; 26th, 71.500.

(e) No market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c. per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c. to 0.15c. per pound.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c. per pound over the current market for the Prime Western but not less than 1c. over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month; the premium on Special High Grade is 1 to 1½c., depending on seller.

Quotations for lead are for common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and one-eighth cent fractions per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, and is usually one-quarter cent below the price paid for such bar silver, this deduction being the allowance for carrying, delivering, and marketing. In addition to foreign silver, the quotations also apply to domestic and Treasury silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

MARKETS—Trends and Prices

Miscellaneous Metals

(Monthly Averages)

Average prices of miscellaneous metals for February and March:

	Feb.	March
Quicksilver, N. Y., flask	88.091	87.296
Antimony (a)	41.730	41.730
Antimony, bulk, Laredo	38.500	38.500
Antimony, in cases, Laredo	39.000	39.000
Antimony, Chinese, (b)	.....	.....
Platinum, oz. troy	85.455	75.111
Cadmium (c)	200.000	200.000
Cadmium (d)	205.000	205.000
Cadmium (e)	210.000	210.000
Aluminum, ingot	17.000	17.000
Magnesium, ingot	20.500	20.500
Nickel	40.000	40.000

(a) New York, packed in cases, in lots of 5 tons or more but less than a carload. (b) Nominal. (c) Producer's price for commercial sticks. (d) Average producers' and platers' quotations. (e) Special shapes sold to platers.

E. & M. J. Weighted Index of Non-Ferrous Metal Prices

(100 is composite for 1922-3-4. Copper, Lead, Zinc, Tin, Silver, Nickel, Aluminum)

1939	77.71	1944	88.74
1940	79.22	1945	90.86
1941	83.49	1946	110.06
1942	86.80	1947	149.46
1943	88.74	1948	168.38

	1947	1948	1949
January	140.88	154.20	185.52
February	140.42	155.63	185.75
March	150.71	155.63	179.31
April	153.14	160.67	.....
May	154.03	161.33	.....
June	150.05	162.30	.....
July	148.73	164.55	.....
August	149.35	177.68	.....
September	150.80	178.26	.....
October	151.05	179.58	.....
November	151.92	185.26	.....
December	152.48	185.52	.....

Official London Prices

Since Dec. 18, 1939, the British Ministry of Supply has named maximum delivered prices for the major nonferrous metals. Delivered prices for consumers in the United Kingdom as of April 1, 1949:

	Per Long Ton £	s.	d.
COPPER:			
Electrolytic, high conductivity	140	0	0
Fire refined, high conductivity	140	0	0
Fire refined, high grade	139	10	0
Fire refined, min. 99.2 percent	139	0	0
Fire refined, min. 99.7	138	10	0
Hot rolled black wire rods	146	0	0
LEAD:			
Soft, foreign, duty paid	112	0	0
Soft, Empire	112	0	0
English refined	113	10	0
ZINC:			
Foreign (G.o.b.), duty paid	106	0	0
Domestic (G.o.b.)	106	0	0
Prime Western and debased	106	15	0
Refined and electrolytic	106	15	0
Minimum 99.99 percent	108	5	0
TIN:			
Ingot, 99 percent	569	0	0

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

(April 1, 1949)

Aluminum, ingot, 99 plus percent, lb. (base price)	17c.
Antimony, spot, lb., 5 tons and up but less than carload, in cases	41.73c.
Bismuth, ton lots, lb.	$2.00
Cadmium, commercial sticks, lb.	$2.00
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.07
Cobalt, 97 to 99 percent, per lb.	$1.80
Indium, troy oz.	$2.25
Nickel, electrolytic cathodes, lb., f.o.b. Port Colborne (a)	40c.
Magnesium, 99.8 percent, carloads, lb., producer's plant	20½c.
Palladium, troy oz.	$24.00
Platinum (Official quotation wholesale lots), troy oz.	$72.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$87.00
Selenium, 99.5 percent, lb.	$2.00
Silicon, minimum 97 percent, spot, carloads, lb.	16.50c.
Tellurium, lb.	$1.75 nom.
Thallium 100 lb. or more, lb.	$15.00
Titanium, 96 to 98 percent, lb.	$5.00@$6.00

(a) Includes U. S. duty.

METALLIC ORES

Beryllium Ore, 10 to 12% BeO, f.o.b. mine, per unit	$25.00@$30.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry	
48% Cr_2O_3, 2.8 to 1 ratio	$34.00@$35.00
48% Cr_2O_3, 3 to 1 ratio	$39.00@$41.50
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$7.60
Mesabi bessemer	$7.35
Old Range non-bessemer	$7.45
Mesabi, non-bessemer	$7.20
Lead (Galena), 80 percent, Joplin, Mo., ton	$234.52
Manganese Ore—Per long ton unit of Mn. basis 48 percent manganese, subject to premiums and penalties, 78c. to 80c., c.i.f. U.S. ports. Quoted prices largely nominal.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	54c.
Tantalite, 60% concentrate, per lb.	$2.00@$2.75
Tungsten Ore, per unit of WO_3:	
Foreign, 60 percent, duty paid	$24.75@$25.25
Domestic, scheelite, 60 percent and upward	$28.50
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	27½c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$102.50

METALLIC COMPOUNDS

Arsenious Oxide (arsenic trioxide) lb., in bbl., carload lots, delivered	6c.
Cobalt Oxide, 70 to 71 percent, lb., ceramic grade	$1.38@$1.40½
Copper Sulphate, 100 lb.	$8.10

ALLOYS

Beryllium Copper, 4 percent Be, per lb. of contained Be	$24.50
Ferrochrome, 65 to 69 percent, per lb. of Cr contained	18.60c.
Ferromanganese, 78 to 82 percent, gross ton, seaboard	$172.00
Ferromolybdenum, 55 to 65 percent Mo, lb. of Mo, contained	$1.10
Ferrosilicon, 50 percent, per lb. of contained Si	11.3c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$2.25
Ferrovanadium, per lb. of V delivered	$2.90
Silicomanganese, 1½ percent C, per lb. contracts	8.6c.
Spiegeleisen, per long ton, 19@21%	$65.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds), ton:	
Crude No. 1	$960@$1,050
Crude No. 2	$492@$550
Spinning fibers	$232@$475
Shingle fibers	$95.50@$141
Paper stock	$78.50@$88
Waste	$58
Shorts	$27@$52
Vermont, f.o.b. Hyde Park:	
Shingle stock	$97.00@$107.00
Paper stock	$68.50@$85.00
Waste	$51.00
Refuse or shorts	$25.50@$46.50
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$11.50@$12.00
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$9.00@$9.50
Bauxite, long ton:	
Domestic, crude, 50 to 52 percent (not dried)	$4.50@$5.00
Domestic, chemical, 55 to 58 percent	(a)$8.50@$9.00
Domestic, abrasive, 80 to 84 percent	$17.50@$18.50
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, airfloated, bulk	$8.50@$9.50
North Carolina, ceramic grade	$18@$22
Feldspar, bulk ton:	
Potash or soda feldspar, 200 mesh	$18.50
Glass spar, white, 20 mesh	$11.75@$12.50
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois, 70 percent, all rail movement, ton	$37.00
Acid 97% concentrate, bulk, ton	$45.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$31
Mica — Domestic f.o.b. mines. Punch, 12 to 22c per lb. according to size and quality. Sheet, clear, 1½ x 2 inch, 70 to 75c.; 2 to 2 inch, $1.10 to $1.20; 2 x 3 inch, $1.50@$1.65; 3 x 3 inch, $1.80@$2.10; 3 x 4 inch, $2.35; 3 x 5 inch, $2.75; 4 x 6 inch, $3.50; 6 x 8 inch, $4 to $6. Wet ground, very fine, $135@$165 per ton. Bulk sales, dry ground, $40@$80 per ton. Scrap, $21 and up.	
Ocher, Georgia, ton, in sacks	$24.00
Pyrites, Spanish, per long ton unit of S, cif. Atlantic ports	(a)12@14¢
Sulphur, Texas, mines, long ton	$18.00
Talc, f.o.b. works, ton:	
New York, purified	$18.50@$20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$14.50

(a) Nominal.

IRON AND STEEL

Pig iron, gross ton, basic, Valley furnaces	$46.00
Steel, f.o.b., Pittsburgh billets, net ton	$59.00
Structural shapes, 100 lb.	$3.275

WASHINGTON REFLECTIONS

McGraw-Hill Washington News Bureau

Boyd Confirmed In Defiance of Lewis

It seems strange that the Senate of the United States should feel proud of itself for having crossed the will of one private citizen. Yet that is exactly how the Senate felt on March 22 when it scorned the wrath of John L. Lewis and voted to confirm James Boyd as director of the U. S. Bureau of Mines.

Both Senators Millikin and Johnson of Colorado followed the Lewis line to the last and voted against Boyd. Senator Johnson had already submitted a bill to divorce the mine safety department from the Bureau, a "compromise" agreeable to Lewis; but if such a move is taken, it will be against the Bureau of Mines' bitter opposition.

Glad though most mining men were to see Dr. Boyd at last firmly installed in his position, many felt keenly the irony surrounding his victory. Obviously a good man for the job, Dr. Boyd might still be serving without pay, still unconfirmed, if John Lewis had not called out his miners and blamed it on Boyd. As it sometimes happens, the Senate did the right thing for the wrong reasons.

One thing can be counted on. The Bureau and Dr. Boyd have not heard the last of John L. Lewis. Whatever plot is now hatching behind those beetling eyebrows, a couple of its sharpest barbs are certainly tagged for the U.S.B.M. and its new director.

Helping Gold Mines Collect for War Damage

As this is written Senator McCarran's bill to reimburse American gold mines for damage suffered under the closing order, L-208, is awaiting Congressional action.

Late in March, the Balatoc Mining Co., of the Philippines, received a down payment of $1,500,000 against the $4,500,000 awarded to it by the United States as compensation for damage to this gold mining property inflicted largely by the U. S. Army during the final battles on Luzon.

According to Special Study No. 9, Civilian Production Administration, written by Mary Claire McCauley, and titled "The Closing of the Gold Mines," WPB Order L-208 was issued in response to what amounted to an ultimatum from the Armed Forces. Several civilian agencies had tossed the problem back and forth for weeks, and had about concluded that no real good could come from closing the gold mines.

Then, on Oct. 5, 1942, Robert P. Patterson and James S. Forrestal stepped in heavily. They told Donald Nelson, "The case of gold mining presents sharply the question of whether we mean business or not in doing everything possible to push war production. . . . The matter has hung fire for some time. We deem it of the utmost importance that prompt action be taken and that half-measures be avoided."

On October 6, General Somervell, at a meeting of the WPB directorate, said, "Failure to stop [gold] production immediately would be inexcusable." He didn't want anyone working in gold mines while the Army was furloughing 4,000 men for the copper mines.

On Oct. 8, 1942, the order went out and the gold mines closed, quite as much in sacrifice to the military idea of necessity as the bombed-out Balatoc mill. It is pointless now to argue the validity of the military view, but the two cases do seem to have much in common.

Hoover Commission Asks Changes in Code

The mining laws, which date back to 1872, and the mineral leasing law of 1920, while generally satisfactory and workable, should be revised, according to the Hoover Commission task force which made a 16-month study of the Government's handling of natural resources.

The reporting group cited the fact that there has been a steady decline in the number of mineral claims patented on public lands, dropping from 2,500 in 1905 to less than 100 in recent years. It also pointed out that the present law doesn't cover concealed deposits because of its requirement of exposure of valuable minerals in order to establish a valid claim.

These are the suggested changes to the laws pertaining to mining locations and patents:

1. Permit the staking of mineral claims on all vacant, unreserved and reserved public land, with certain exceptions such as the national parks and monuments, and other obvious reservations.

2. Recognize the validity of claims without the requirement of "discovery" of valuable minerals, so that ground without surface exposure or other positive evidence of ore or valuable mineral deposits may be held for sufficient time to complete exploration or to secure evidence indicative of its prospective value.

3. Eliminate reference to alleged structural forms of an orebody, such as are implied by the words "lode," "vein," "apex," or other geologic terms, and locate claims in rectangular areas conforming wherever possible to lines and corners of the public land surveys, and not to the assumed course of some geologic body.

4. Restrict underground rights to vertical planes through the boundary lines of the claim, thus eliminating the present provision of extralateral rights as far as new claims and patents based on them are concerned.

5. Cancel the rights of new unpatented mineral claims at the end of three years if evidence of potential value of ore for valuable mineral deposits that is acceptable for patenting, as subsequently defined, has not been obtained. At the same time, there should be the privilege of renewal of the rights, without patenting, for subsequent periods if work is in progress that is approved by the Geological Survey as suitable for testing the ground.

6. Give the Geological Survey the right to cancel new unpatented claims at any time, if it is requested to examine the ground by the agency administering the land, and if it finds prospective value of the ground too slight to warrant further expenditure of money or effort on its exploration.

7. Require that all claims be located with reference to fixed points and that they be surveyed prior to application for renewal; or that they be located by legal subdivisions wherever section corners and boundaries have been established.

8. Record a duplicate of location notice at the appropriate land office.

9. Grant patents upon establishment of the potential value of the ground for ore or mineral deposits, with the acceptance for this purpose of such evidence as proximity to known deposits of value, projection of ore bearing loci, extension of fracture or sheer zones with indications of mineralization, presence of gangue minerals or of rock alteration known elsewhere to be associated with ore, and of other evidence that meets with the approval by the Geological Survey.

10. Drop the requirement of assessment work for existing unpatented claims if the owner will accept the new rules and regulations governing claims that may be adopted in accordance with the recommendations in this report.

11. Recognize the presumptive right of the hold of a mineral claim to the surface but restrict surface uses, prior to patenting, to those necessary in connection with exploration activities. Grazing and cutting

of timber should be in accordance with regulations of the Forest and Range Service and be limited to the needs of the proposed operation.

Changes in laws pertaining to leasing, as proposed by the task group:

1. Provide for a prospecting period with liberal terms for exploration in leases covering areas where available data are not sufficient to reveal the extent, quality, mineability and methods of processing essential to the determination of feasibility of established or new types of commercial operations.

2. Grant prospecting rights on areas of sufficient size and under provisions formulated by the Geological Survey that will encourage thorough and complete search for mineral deposits and that will justify the required expenditures.

3. Permit exploration for all minerals within the area covered by leases and provide for their orderly development, with exclusive rights granted to the prospector on a fractional part of the total area (or otherwise a minimum area), and a preference right for the remainder of the area or so much as may be in keeping with sound public policy and feasible of development with the financial resources available.

4. Remove all limits or restrictions on overriding royalties on oil or other leases on public lands and Indian lands.

Labor's Demands Meet Trouble In Congress

Organized labor's legislative demands are getting rough treatment by the new Democratic-controlled Congress.

The minimum wage will be raised to 60c. or more, but only few additional workers will be brought under the wage-hour law's coverage.

The buffeting given these and other bills has raised considerable concern among labor leaders as to how far the 81st Congress will go in revising the Taft-Hartley law, labor's No. 1 issue.

Nobody expects the Thomas-Lesinski bill containing Truman's proposals for repealing Taft-Hartley and reenacting the Wagner Act with minor "improvements" to be passed "as is." A number of stiffening amendments will be added, some of them lifted from Taft-Hartley. Most of them will be put over by a coalition of Republicans and Southern Democrats, with Taft, Morse and Ives the key men in the Senate. What they can agree on will be almost certain of adoption.

These are some of the things you may find in a new labor law:

CLOSED SHOP—Permit it, but also permit an employer, if he wishes, to refuse to bargain on it. Also: Allow unions to expel members and get them discharged under union security contracts for: 1, being Communists; or 2, engaging in wildcat strikes.

SUPERVISORS — Allow unionization of foremen only in independent unions which have no association with rank-and-file workers.

NATIONAL EMERGENCIES — Permit injunctions on request of the president.

FREE SPEECH—For both union leaders and employers.

CONCILIATION SERVICE—Independent of Labor Department.

COMMUNIST AFFIDAVITS—For both union officials and employers.

Hoover Group Would Streamline Interior

The Interior Department should be regrouped and be given more clearly the mission of development of subsoil and water resources. This is the Hoover Commission solution to the ills of the Department, as made to the Congress last month.

The Commission report points out the need for more extensive geological explorations, more research into improved methods of mining and recovery, more adequate management of the government relations to title, leases, royalties and reservations, and a "study leading to revision of our mining laws."

To do all this the Hoover group would have Congress create a center of mineral services within Interior which would also advise other government agencies and eliminate the myriad of duplicating staffs working on mineral problems.

The Department would be regrouped into three main subdivisions according to the Commission's recommendations. They would be: the Mineral Resources Services, Water Development and Use Services, and Building Construction Services. The Mineral Resources Group would include the following agencies and jobs: The Geological Survey; Bureau of Mines; Oil and Gas Division; Administration of Mineral Leases, Title Records and Reservations; Leasing of Mineral Lands (now handled by the Agriculture Department); Investigations into Natural Gas Resources (now handled by the Federal Power Commission); operation of the government tin smelter at Texas City (now run by the Reconstruction Finance Corp.), and the new advisory function to serve a score of federal agencies dealing with minerals.

Three of Interior's agencies would be transferred to other government agencies. The Bureau of Indian Affairs would be incorporated into a new executive department for social security, education and Indian affairs. The Bureau of Land Management (except mineral lands) would be transferred to the Dept. of Agriculture. The Commercial Fisheries section of the Fish and Wildlife Service would be given to the Commerce Department.

A minority group of the 12 commissioners making the report on Interior would change the name of the agency to the Department of Natural Resources, a single-purpose agency to unify management of mineral, water and public land resources.

The most specific recommendations concerning improvement of Interior's job are put forth in the Commission's task group report on natural resources.

In its premise concerning federal agencies concerned with mineral resources, the task group lauds the Bureau of Mines and the Geological Survey for the work they are doing. "Continued support and steady maintenance of their current activities are certainly warranted, but expansion is hardly needed except to meet calls for technical service from other organizations such as the Atomic Energy Commission, for special statistical and economic investigations, and for expanded hydrological investigations (recommended elsewhere in the report)."

The task group points out that at least 25 federal agencies are concerned with mineral resources, and "many of these are carrying on statistical and economic investigations of mineral resources, mining, industries based on minerals, and of the domestic and international commerce growing out of this important segment of our economy." These activities frequently involve extensive duplication which could be avoided by calling on one or the other of the two Interior services, the report states.

In emphasizing the need for intensive exploration, the task group divides vital minerals into three classes: 1. Those in relative abundance within our borders, including iron, copper, lead, zinc, molybdenum, coal and petroleum; 2. Those that can be obtained from domestic sources only at considerably greater cost than foreign production and not in adequate quantity to meet the nation's full needs, including bauxite, manganese, chromium, tungsten and mercury; 3. Those minerals such as nickel and tin that appear to be lacking within our boundaries.

"Private enterprise can be relied upon in the future, as in the past, to meet the nation's needs for exploration development and exploitation of deposits of the first class of minerals." The report adds a proviso to this statement which reads: "Provided that the normal incentive of profits commensurate with the risks inherent in such enterprise is not destroyed through excessive taxes or arbitrary controls."

For deposits in the second category, governmental exploration and development of mines and the actual support of operations may be justified on the grounds that (a) the position of the country with regard to reserves might be notably improved by such work, and (b) the preservation of mines and mills on such deposits provides a certain measure of protection if foreign supplies were cut off by war, the report states.

NEWS OF THE INDUSTRY

Miners and Prospectors Stress Non-Metallics at February Convention in Santa Fe

Some 275 members of the New Mexico Miners & Prospectors Association at an annual convention at Santa Fe Feb. 10-12 protested the continuance of the emergency federal excise tax on freight rates as "particularly burdensome to the mining industry" of the state. A policy resolution also asked that development, exploration and research be allowed as operating expenses in computing federal taxes.

Jack Pierce, secretary-treasurer of the Association, outlined the progress of the organization during the past year. Individual membership rose from 596 to 1,030. Chapters were established in Magdalena, Santa Rita, Albuquerque, Santa Fe and Hot Springs. Efforts have continued to better inform the people of the state of their industry and their resources.

In line with the Association's policy of promoting New Mexico's resources in New Mexico was the talk by Donn M. Clippinger, mining engineer of the N. M. Bureau of Mines, entitled "And We Still Have Other Non-Metallics." Looking back 10 years, he stressed the advancement of potash and fluorspar in the state. Since 1938, annual potash tonnage has grown from 900,000 to 4,850,000 tons, an increase of 440%; fluorspar from 4,100 to 28,500 tons, or 600%. Perlite deposits once considered worthless are now the basis of a rapidly growing industry.

Pointing out that the value of most non-metallics depends on certain commercial applications, usually requiring substantial capital, Mr. Clippinger urged prospectors to learn to recognize all industrial minerals and rocks and their possible uses; to take further advantage of the services offered by the Bureau of Mines, in order that the Bureau and prospectors together might push exploitation of the state's natural resources. Mr. Clippinger listed numerous manufactured goods now shipped into New Mexico in great quantities which are made from non-metallics found in abundance in that state: gypsum board and plaster, ceramic wares, clay pipe, drilling-mud compound, granite monuments. He recommended less complaining about freight-rate isolation and more home-state industrialization.

R. R. Knill and P. S. Dunn, of Potash Company of America, Carlsbad, discussed the developments in New Mexico's potash industry in 1948. The three producing companies in the state, International Minerals & Chemical Corp., United States Potash Co. and Potash Company of America, all had construction programs under way to increase output of agricultural muriate of potash. International Minerals & Chemical Corp. is rebuilding the sulphate section of its plant to enhance the recovery and improve the quality of sulphate of potash, as well as adding facilities for a new product, chemical grade potassium chloride. About 92% of the potash produced is used in agriculture and 8% to make potassium chemicals such as nitrate, chlorate, hydroxide and carbonate.

The Duval Texas Sulphur Co., which drilled 33 holes last year, Southwest Potash Co. and Wills & Weaver were among new companies active in the Carlsbad area. The Continental Potash Co., continuing experiments in the solution mining of potash deposits by sub-surface leaching methods, concluded that "the mining of potash by wells is practical in marginal deposits of ore which are insufficient to justify the sinking of a shaft."

G. J. Ballmer, mines supt. of Kennecott's Chino Mines Division, reported 1948 developments in Southwestern New Mexico, where better than 3,250 men were employed directly in mining, milling and smelting and received approximately $1 million per month. Tonnage mined by the copper producers amounted to 550,000 to 600,000 tons per month. Zinc producers, who also recover some lead and a little copper, gold and silver, mined about 60,000 tons of ore per month and hope for an average of 72,000 tons monthly in 1949.

The Kennecott Copper Corp. did extensive diamond-drilling in the district and is now sinking a shaft. The Ground Hog unit of American Smelting and Refining Co. started a shaft, to be primarily an operations shaft, which may exceed 1,800 ft. Sinking has progressed at an unusual rate; meanwhile production was kept at a high level through the other shaft. The Bayard unit of U. S. Smelting, Refining and Mining Co., operating five shafts last year, were deepening one of these as well as sinking a new shaft. The Empire Zinc Co. at Hanover continued regular underground operations, made extensive alterations on their selective flotation mill and expanded the open-pit zinc mine.

Peru Mining Co. was forced to close several operations after removal of the premium on lead and zinc, but reopened some of these as the zinc price advanced. They have also opened a small open-pit zinc mine. Phelps Dodge Corp.'s Burro Mountain branch at Tyrone and The Banner Mining Co. at Lordsburg were both closed several months by a CIO strike. Phelps Dodge has continued its copper leaching operations and did some development in its underground fluorite mine.

U.S. Steel Properties Produce Record Tonnage

Last year the United States Steel Co. mined 48.9 million tons of ores from its own properties, a new peacetime record, according to the company's annual report released last month. About three million tons was low-grade ore from which iron ore concentrates were derived by methods developed by U. S. Steel. Thus far the reserves of coal, iron ore and limestone have been adequate to supply the raw materials necessary for the company's unprecedented production of steel in recent years. Long range development programs now under way will endeavor to assure an adequate supply of high quality raw materials for the future.

AEC Restores Lands to Public Domain

The U. S. Department of the Interior has restored to the public domain approximately 54 sq. mi., in Grand and Mesa Counties, of the Colorado carnotite ore fields and has withdrawn from mineral entry for use of the Atomic Energy Commission approximately 40 sq. mi. in Montrose County, Colo., and San Juan County, Utah.

After completing surveys of the Grand and Mesa Counties area, the Atomic Energy Commission decided that diamond-drilling costs would be too high because the rock formation to be investigated was at such great depth. It was emphasized by the Commission, however, that restoration to the public domain of this area should not be considered a determination by AEC that the area does not contain valuable deposits of uranium ore.

The Commission announced that it plans to keep the total area withdrawn for exploration at a figure not in excess of about 150 sq. mi.

Mining Engineers

The U. S. Civil Service calls attention to several vacancies for mining engineers. The jobs are located in Washington, D. C., and throughout the country. Beginning salaries range from $3,727 to $6,235 a year.

No written test is required. To qualify, applicants must have had either appropriate college study or technical experience, or a combination of both. In addition they must have had from one to four years of professional experience in engineering. Announcements and application forms may be obtained from the U. S. Civil Service Commission, Washington 25, applications accepted till June 30.

Five Anaconda Furnaces Make Ferromanganese

Production of ferromanganese has been started at the Anaconda Reduction Works, Anaconda, Mont. The first of a series of electric furnaces now under construction was started Feb. 5. The present program calls for the completion of four furnaces by the end of March and another furnace by August. On a four-furnace basis the production of standard grade ferromanganese will total around 1,792 tons a month.

Anaconda has been mining relatively low-grade manganese carbonate ore at Butte and producing manganese oxide nodules averaging 60% Mn. Additional iron required in making ferromanganese is supplied from iron ore, of which approximately 280 tons a month will be consumed when operating on a four-furnace basis and 350 tons a month for five furnaces.

Labor Supply Improving, Equipment Still Slow

From a query directed by E&MJ to the more important metal mining districts in the U. S., the supply of unskilled labor appears to be generally satisfactory, while there is still a shortage of skilled workers. In Utah mines and some on the Mesabi iron range, a scarcity of skilled underground miners is noticeable. Some types of open-pit labor are also reported as scarce on the Mesabi. A surplus of unskilled labor is indicated in observations from both Idaho and Utah. Most union contracts are up for renewal in May or June.

Mine operators from all sections express some dissatisfaction on deliveries of equipment. While several observers report general improvement on this score, deliveries on shovels, tractors, electrical equipment and motors still require one to three years. In Utah, steel goods and lumber are easing considerably.

School of Mines Sponsors Engineers Day at Golden

Everyone interested in engineering, particularly that of the mineral field, is invited to the 15th annual Engineers Day of the Colorado School of Mines, Golden, Colo., April 22-23. The meet is to feature technical sessions in geology, geophysics, mining, metallurgy and petroleum production as well as tours, contests, and exhibits.

Alfred M. Staehle, vice president of the McGraw-Hill Publishing Co., as the featured speaker for Engineers Day proper, will discuss some of the important, non-technical aspects of engineering. Speakers scheduled for technical sessions on mining and metallurgical engineering include: H. A. Walker, general manager, Homestake Mining Co.; M. B. Kildale, chief geologist, International Smelting and Refining Co.; Dart Wantland, U. S. Bureau of Reclamation; Max W. Bowen, vice president, Golden Cycle Corp., and F. R. Anderson, Gardner-Denver Co.

For Processing Gold

Registration papers have been filed in Pretoria by South African Goldware, Ltd., to process gold. The new company, referred to recently by Finance Minister Havenga, is capitalized at £500,000. The processing company was organized to purchase and process South African gold at premium prices over the $35 per oz. basis, the official quotation supported by the International Monetary Fund.

Empire Mining Congress

The Fourth Empire Mining and Metallurgical Congress convened by the Empire Council of Mining and Metallurgical Institutions is to be held in Great Britain July 9-23, 1949. The Congress will give scientists, engineers and others concerned with the mining and metallurgical industries the opportunity to meet and discuss technical progress and problems and the development of the mineral resources of the Commonwealth.

Further information may be obtained from The Joint General Secretaries, Fourth Empire Mining and Metallurgical Congress, 436 Salisbury House, Finsbury Circus, London, E.C.2.

MMSW Wage Policy

The wage policy committee of Mine, Mill & Smelter Workers (CIO) meeting in Denver last month went on record for a 25c. general wage increase; adequate health, security and pension plans financed by employers; upward revision of wage rates for skilled workers to widen the spread between skilled and unskilled wages; and a shorter work week, possibly 35 hr. at the same pay now received for 40 hr.

The committee sent a telegram to Philip Murray, president of CIO, protesting "raids" on MMSW locals in Alabama by United Steelworkers of America, which Murray also heads.

Liberian Iron Ore

Republic Steel Corp. has announced purchase of stock interest in the Liberia Mining Co., Ltd., and a concession containing substantial tonnages of ore near the seaport capital of Liberia, Monrovia. The Republic company estimated that completion of railroad and other facilities for bringing the ore out of the country may take about two and a half years. Hematite and magnetite ore revealed at ground level assays 68% iron and has low phosphorus, sulphur and silica content.

MINING IN 1867

These items made news in E&MJ for April, 1867:

☛ Several attempts have been made in France to supply the electric light to the miner's lamp, and the following is a description of such lamps now made by M. Gaiffe, a philosophical instrument maker of Paris: M. Gaiffe has availed himself of the curious effect produced by nitrogen and glass of uranium, which give the complementary colors rose and green which united produce a white light rather more intense than that obtained by means of carbonic acid. M. Gaiffe's apparatus consists of a small bobbin, a pile and a Geissler's tube. Within the tube are spirals formed of uranium glass within which is pure and perfectly dry nitrogen. . . . The pile and bobbin are contained in a small box which is strapped, knapsack-like, on the miner's back, the conductors passing one beneath each arm. . . . The whole apparatus weighs 7 pounds and its present price is 70 francs.

☛ The subject of underground transportation has attracted more of popular attention since the project of an underground city railway for New York has been under discussion, but it is a subject always of interest to the miner. The aim is to move the mineral in the cheapest manner. If the quantity is small, and the distance short, a man pushes the loaded car out and the empty one back. If a horse or mule can be used, he will move it cheaper than men can. But . . . where the mineral, such as iron ore or coal, is bulky, and large quantities are to be moved, economy and rapidity of transportation from the interior of the mine to the shaft may determine the question of profit. The question is, can any power be economically substituted for horses or mules? The answer is, yes; steam has been . . .

☛ New Jersey correspondence draws a very sad picture of the districts in which the strike of the iron miners has taken place. All business operations have been suspended, and the country deserted. The machinery of the mines was kept going to prevent them filling with water, and also to obviate the loss of time necessary to set them going again should the miners return to work immediately. The men "on strike" march about to the different mines and compel those in them to abandon work. . . . The Morris men have been the leaders of this movement, and have resorted to every means short of actual violence to promote the strike, and with considerable success.

NEW BOOKS

STRUCTURAL GEOLOGY OF CANADIAN ORE DEPOSITS: A symposium arranged by a Committee of the Geology Division, Canadian Institute of Mining and Metallurgy. Published by Authority of the Council, Can. Inst. Min. Metal., Montreal, Quebec, Canada, 1948. Pages 948 + X; with 172 text figures (chiefly maps and sections) and 3 colored plates.

Organized essentially on a regional basis this interesting volume deals with each of the three major divisions of Canada in which ores are found—the Cordilleran Region, the Canadian Shield, and the Appalachian Region—subdivided into belts or areas. Generally speaking, an introductory paper is presented for a given area, followed by descriptions of the individual districts, properties, or mines, each prepared by a geologist especially well experienced in the region described.

From the introductory sections the reader can see the relationship between a given deposit, described later in the book to the broader structural features of the region. Such a presentation sets off in strong contrast the structures that chiefly controlled ore deposition in the Cordilleran Region, mainly faults and breccia zones, from those more typical of the pre-Cambrian Shields, commonly localized, according to Dr. Gill, by favorable rock types, by junctions of contrasting trends, and by major shear zones. This fertile approach leads to the recognition of promising features which, when sought elswhere, may come to produce more ore.

The section on the ore deposits of the Cordilleran Region brings together for the first time as clear a picture of that interesting and varied country as could possibly be expected when it is recalled that the detailed areal geology of the Canadian Cordillera, like that of the United States, is still largely unmapped. Of special interest is the section on structural features as related to ores. Here, instead of a purely statistical approach (obviously inapplicable in view of the present state of knowledge), tables are used to cite examples of the influence of major orogenesis, batholiths and stocks, regional faulting, minor fractures, lithologic features, folding, tabular intrusions, structural barriers and post-mineral faults. A section on lenticular veins, locally important in these deposits, would also have been of much interest. It is impossible to cite the numerous excellent descriptions of individual districts in this region—many of them presented in comprehensive form for the first time.

Especially "typical," in the eyes of most non-Canadians, is of course the great pre-Cambrian shield with its rich gold ores. A perusal of the detailed descriptions of the deposits in this great region, seems, to the reviewer, to support Dr. Gill's generalization that ore channelways are here most commonly along faults; this is well illustrated by districts from many parts of the Shield.

The less important yet very interesting deposits of the Appalachian Region of Canada are strangely suggestive structurally of those of the corresponding sections of the United States and clearly are of similar origin, affected by similar structural controls.

If it lacks anything, the work might perhaps have had a little more cross-references from the detailed to the more general statements. This is more than balanced, however, by the multiplicity of descriptions, the excellently illustrative figures, and the purposeful way in which each author has kept to his main objective. All in all this is an excellent contribution to basic economic geology, the sort of which many more are needed—an attempt to focus what is known upon the formulations of basic geologic principles.

CHAS. H. BEHRE, JR.

DESIGN OF INDUSTRIAL EXHAUST SYSTEMS, 2nd Edition. By John L. Alden. Published by The Industrial Press, New York, 13, N. Y. Pp. 247. Price, $3.50.

Since the first edition appeared in 1939, sufficient advances and refinements in exhaust system practice have been made, to provide material for two new chapters and other lesser additions in this edition. The reader is supplied information for designing, building or buying an exhaust system which will clean air satisfactorily in compliance with industrial health codes and good engineering practice. The scope of the book includes exhaust ventilation, low pressure pneumatic conveying, design of hoods, piping and structural details and the selection of dust separators, centrifugal and axial flow fans.

HANDBOOK OF URANIUM MINERALS. 2nd Edition. By Jack DeMent, research chemist and head, Fluorescence Laboratories, and H. C. Dake, editor, The Mineralogist Magazine. Published by the Mineralogist Publishing Co. Pp. 96. Price, $2.00.

This revised and enlarged edition, primarily a guide to the uranium prospector, contains abundant information for the student. Included are an up-to-date listing of uranium minerals with their world occurrence and details of prospecting methods. The book outlines the use of field and laboratory instruments, especially the Geiger counter.

GEOLOGY FOR THE LAYMAN. By Alexander MacLean. Published by The Northern Miner Press Ltd., Toronto, Canada. Second Edition. Pp. 176. Price, $3.00.

This compact little volume presents a series of lectures prepared to give business and professional men who are unfamiliar with geological literature an understanding of the principles and terminology employed in this science. Both physicial and historical geology are discussed under appropriate chapter heads. While major emphasis is devoted to geological conditions in Canada the discussion is sufficiently broad to be of value in other areas as well. A large amount of information is packed into little space and for engineers the book will be distinctly useful for quick reference on a field trip when a more comprehensive volume must be left behind. Numerous line cuts clarify the text. After digesting Professor MacLean's adequate presentation of his subject, the lay reader should have considerable confidence in his ability to comprehend the highlights of an ordinary geological report.

W. F. BOERICKE

BUSINESS, LEGAL, AND ETHICAL PHASES OF ENGINEERING. By D. T. Canfield, M.S.E.E., E.E., and J. H. Bowman, M.S.E.E., E.E., professors of electrical engineering, Purdue University. Published by McGraw-Hill Book Co., New York. Pp. 358. Prince, $4.50.

Objective of this textbook is to acquaint the engineer with the nontechnical phases of the profession, frequently omitted in the modern curriculum. Full sections on business economy and cost determination, stressing the indivisibility of engineering and business, give the reader a working knowledge of financial instruments and the principles of accounting. The portion of the book dealing with business law presents the fundamental and salient points of current legal practice as they affect the engineer in his work. Of particular interest to the neophyte will be the section on engineering procedures, containing pertinent data on contract bids, specifications, patents and copyrights. The humanistic aspects of the profession as presented in the chapter on professional ethics, is worthwhile reading for all engineers.

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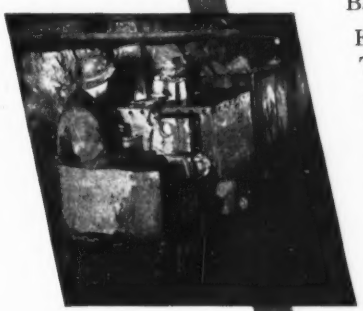
PRODUCTION BOOSTERS

Battery-powered haulage units and EXIDE-IRONCLAD BATTERIES

Increased tonnage—low haulage costs—and with maximum safety! That's what the records show in operations where battery-powered haulage equipment and Exide-Ironclad Batteries are on the job.



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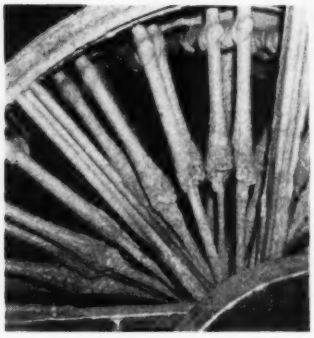
OPERATING IDEAS



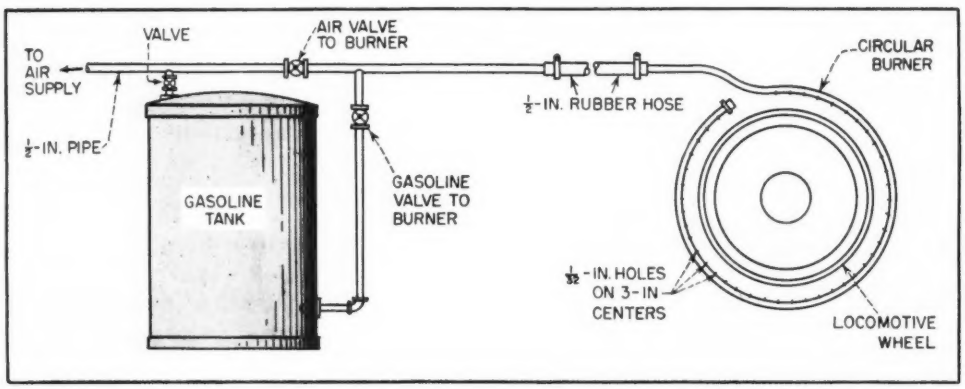
LIME COATING like this accumulated on filters at the Wright-Hargreaves mill.

THE OLD WAY of removing lime coating was costly and time consuming.

MALCOLM BLACK, mill superintendent (above) describes the new way below.

Acid Removes Lime Coating on Filters

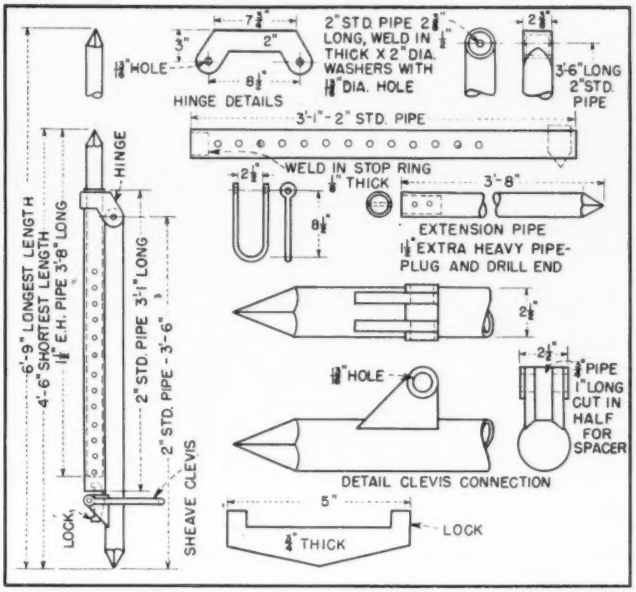
Lime coating on drum filters in cyanide plants is difficult and costly to remove. For instance, Malcolm Black, superintendent of the Wright-Hargreaves mill at Kirkland Lake, Ontario, reports that lime coating on filters formerly had to be removed every three to four years with pneumatic hammers as shown above. But today, this job is done much more easily by pouring 2 tons of HCl to which has been added an acid inhibitor and a little No. 5 antifoam H.F. and 6 tons of water into the boot of the drum filter. Then a small pump in closed circuit is used to circulate the acid solution through the pipes and over the drum to dissolve the lime coating. This process costs but a fraction of previous methods. This job is done at a time when the cover of the filter has to be changed anyway.



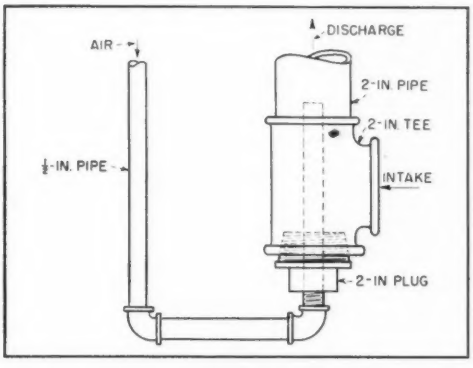
Heater Simplifies Removal of Mines Locomotive Tires

The heating unit shown above has been useful in expanding and removing worn mine-locomotive tires up to 72 in. in diameter. The burner is made of ½-in. pipe, bent to a circle 4 in. greater in diameter than that of the tire. One end of the burner is capped and the other attached to a compressed air line and gasoline feed line as shown. Air pressure in the tank should be maintained at 70 lb. for best results. When starting the heater, it is important that the air valve to the burner be turned on before the gasoline feed valve is opened. Both valves should then be regulated to produce the amount of heat needed. When shutting off the heater, the gasoline feed valve must be closed first.

Adjustable Gin Pole for Slusher Block


HINGE DETAILS
2" STD. PIPE 2½" LONG, WELD IN ½" THICK X 2" DIA. WASHERS WITH ⅝" DIA. HOLE
3'-6" LONG 2" STD. PIPE
3'-1" - 2" STD. PIPE
WELD IN STOP RING ½" THICK
3'-8"
EXTENSION PIPE 1½" EXTRA HEAVY PIPE - PLUG AND DRILL END
⅝" HOLE
1" PIPE 1" LONG CUT IN HALF FOR SPACER
DETAIL CLEVIS CONNECTION
5"
¼" THICK
LOCK
6'-9" LONGEST LENGTH
4'-6" SHORTEST LENGTH
1½" E.H. PIPE 3'-8" LONG
HINGE
2" STD. PIPE 3'-1" LONG
2" STD. PIPE - 3'-6"
SHEAVE CLEVIS
LOCK

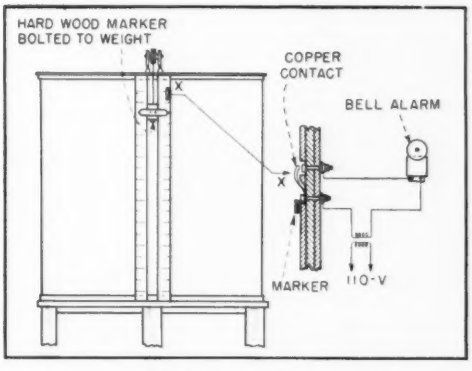
A simple piece of equipment that has speeded up installation of scraper layouts in the mines of Idaho Maryland Mines Corporation at Grass Valley, Calif., is the adjustable steel gin pole for slusher blocks shown in a self-explanatory manner in the accompanying drawing. It is made from standard 2-in. pipe, and auxiliary parts include a welded-on clevis connection, lock, hinge and pole extension made from 1½-in. pipe. The rigid pole member containing the steel hinge at the top end and the clevis connection near the pointed bottom end is 3 ft. 6 in. long. The adjustable member with 13/16-in. holes drilled at 2-in. intervals and held to the rigid unit by the hinge and lock mentioned is 3 ft. 1 in. long. The 1½-in. extension pipe with point at one end and two 13/16-in. holes at the other end is 3 ft. 8 in. long. When fully extended the gin pole will have a maximum length of 6 ft. 9 in. Credit for item presented is due J. C. O'Donnell, mine superintendent.



Syphon for Mill Floor Sumps

The problem of draining mill floor sumps periodically was solved satisfactorily at one small Mexican mining operation by installing the simple syphon shown above.

The syphon is made up of standard pipe fittings and pieces of scrap pipe. The 2-in. plug at the bottom of the Tee was drilled and tapped to fit the threads on a short piece of ½-in. pipe. Threads on this short piece of ½-in. pipe were extended so that the pipe would extend beyond the bottom of the plug and into a ½-in. elbow. Compressed air at 90-lb. pressure is introduced into the unit downward through the vertical ½-in. pipe and travels upward in the 2-in. discharge pipe aerating and carrying water out of the sump in the mill floor.



Low and High Water Alarm

Mine, mill and smelter operators will find the low water alarm arrangement shown a convenient and reliable means of warning when the water level in a tank or reservoir has gone down to a predetermined point. It is simple in design and requires a minimum number of parts. In fact, the complete layout consists of a copper contact and two copper bolts set into the gage board at X, and an electric alarm bell system. Operation, too, is simple. As the indicator or marker on the gage board moves over the contact at X, it presses the contact against the head of the copper bolt, thus closing the electric circuit and causing the alarm bell to ring. To avoid tank overflow, a parallel contact should be installed to indicate the high water level.

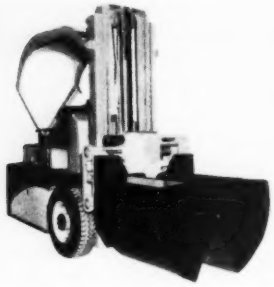
EQUIPMENT NEWS

With bigger machines for the big jobs . . .

ALL-ELECTRIC MACHINE, made by Marion Power Shovel Co., Marion, Ohio, has a 3½-cu. yd. dipper and 33-ft. boom. All motions are electrically controlled.

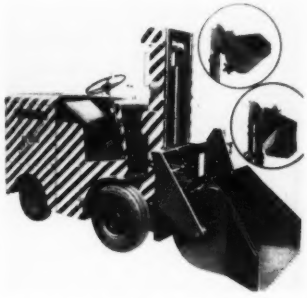
REAR DUMP WAGON, the E-10 Tournarocker, is powered by a 210-hp. prime mover and has a capacity of 41 cu. yd. Manufactured by R. G. LeTourneau, Inc., Peoria, Ill.

With smaller units for maneuverability and versatility . . .



CLAMSHELL BUCKET of 7/16-cu. yd. capacity is replaceable by material handling devices on lift truck made by Hyster Co., Portland, Ore.

STAKE PLATFORM on Moto-Bug may be substituted for by 10-cu. ft. self-dumping hopper body. Made by Kwik-Mix Co., Port Washington, Wis.



ELECTRIC TRUCK made by Crescent Truck Co., Lebanon, Pa., is equipped with self-loading scoops which are interchangeable with standard forks.

Operators turn to special equipment and modern design to pare costs

If you should happen to see a common, or garden variety, hand shovel a few years from now, chances are it will be in a museum. Certainly manufacturers of earthmoving and material handling equipment are leaving no stones (or anything else) unturned in their effort to simplify the most complex problems and at the same time cut costs. Each item shown here, while not a radical departure from the orthodox, presents refinement in current design contributing toward that end.

Wartime scarcity and the present high cost of labor have made feasible the mechanization of even the smallest material handling units and manufacturers now offer full lines of highly mobile and extremely versatile machines. Typical are the small units shown above, with standard forks or special material handling devices readily interchangeable for scoops or hoppers. While these rubbed-tired machines are more suitable to the mill or plant, their tracked counterparts are available for more rugged territory.

On the other end of the scale, there is the ever-present tendency toward larger dipper, bucket and carrier capacities. At present, Marion is testing the practicality of a 45-cu. yd. dipper at a Hanna Coal Co. mine in southeastern Ohio.

Most of the attention however is being given to improvements in the medium-sized equipment field with emphasis on push-button control and efficiency of operation. An important item under consideration is the safety and comfort of the operator, with an eye toward increasing his effectiveness and output.

You Get GREATER ENGINE PROTECTION with T5X—*the famous purple* oil*

1. T5X—the remarkable purple motor oil—gives greater protection to any type of internal combustion engine in any industrial operation. This fully compounded, detergent-type oil easily passes the most demanding lubricant requirements—including the U. S. Army Specification 2-104b, the "L-4" Coordinating Research Council gasoline engine tests and the grueling 500-hour continuous-run Diesel engine test.

2. T5X is a highly refined, 100% pure, paraffin-base oil obtained from highest quality base stock. An exclusive detergent compound is added to this base stock that retards sludge formation to a remarkable degree. With T5X, oil lines, ring grooves and pistons stay clean far longer!

3. A special oxidation inhibitor in T5X greatly retards oxidation and gives high heat stability. A neutralizing agent protects against corrosion. Another ingredient suppresses foaming even under the most adverse operating conditions. With T5X, wear is reduced to a minimum!

4. T5X forms an extremely tenacious and enduring oil film on metal surfaces that gives maximum protection against scuffing and seizure. This tough film assures the greatest possible defense against rusting — even when engines are idle for long periods.

For full information on T5X phone your local Union Oil Representative or write Sales Department, Union Oil Company, Los Angeles 14, California.

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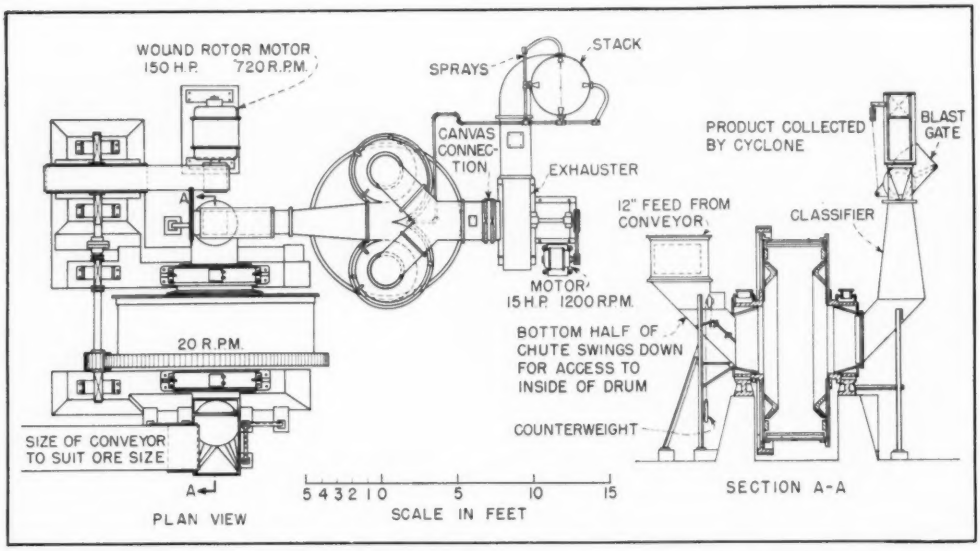
SUCCESS-TESTED PRODUCT

*T5X gets its distinctive color from an exclusive ingredient that helps give the oil its remarkable stability.



325 TONS PER DAY of minus-12 in. lead-zinc ore can be reduced to 85% minus-200-mesh in this 12-ft. dia. mill.

Crushing-Grinding Unit Is Capable of Reducing Run-of-Mine Feed to Fine Grind in Single Operation

If you are looking for a way to do your crushing and grinding in one operation, a new mill developed by Aerofall Mills, Ltd., Toronto 1, Can., may be the answer to your problem. The mill is a dry, combined crushing-grinding unit, capable of taking run-of-mine or quarry-sized material (minus-12 in. in the smaller units, and minus-18 in. in the larger sizes) and reducing it in a single operation to as fine as 99.5% minus-325-mesh. Where a coarse grind is required, the mill is capable of a product in the 10-mesh range.

Air classification is employed giving a differential grind on the constituents of various specific gravities. The resulting final product is metallurgically equivalent to an appreciably finer grind than is obtained in ball or tube milling practice.

Either a wet or dry cyclone may be used to collect the product from the mill. With the wet system, no further collection is required. In the dry system, the air classification fan is followed by one of the standard methods of fine dust collection such as a bag-type filter.

Since the system is constantly under a partial vacuum, atmospheric dust concentration is extremely low and no dust control measures are required for the plant.

Depending on the nature of the feed, the unit may be operated utilizing the material itself as the crushing-grinding medium, or a charge of steel or tungsten carbide balls may be used. In the latter case, a small charge, only 2.5% of the mill volume, is required. Since the function of the balls is that of impact reduction only, the wear factor is low. The indicated figure for forged alloy steel is 0.20 lb. per ton, while the factor for tungsten carbide balls is 0.005 to 0.01 lb. per ton.

The mill has been successfully employed on extremely tough and hard material. In one case an ore was treated containing 40 to 60% quartz, with the remaining constituent a banded iron jasperlite with alternate bands of chert. This material was fed to the mill after passing through a 12-in. one-way grizzly. The ore itself was used as its own crushing-grinding medium yielding a final product of 75% minus-200-mesh.

On the other end of the scale, a barite ore was treated with a resulting product of 99.5% minus-325-mesh from run-of-mine minus-12-in. feed. In this case also, the ore served as the crushing-grinding medium.

The accompanying table does not indicate capacities when a charge of steel or tungsten carbide balls is used. For comparison, in the case of quartzite, where ore only is used for crushing and grinding, the smallest mill has a capacity of 8.0 tons per 24 hours. The use of the steel balls increases that figure to 12.0 and tungsten carbide increases it to 20 tons per day. With the largest unit, the use of ore only, produces 3,300 tons, while steel balls increase capacity to 4,950 tons and tungsten carbide to 7,425 tons.

Capacities* of Aerofall Mill
TONS PER 24 HOURS

		Mill Diameter—ft.	5.0	12.0	20.0	30.0
		Length—ft.	2.0	4.0	5.0	5.0
		Feed size—in.	10	12	18	18
Ore	Grind		Tons per 24 Hours			
Siliceous	70% minus-200-mesh		10.0	242	1230	4125
Quartzite	minus-28-mesh, plus-150		8.0	194	975	3300
Barite	99.5% minus-325-mesh		4.7	115	575	1930
Calcite	58% minus-325-mesh		7.0	170	860	2900
Sandstone	minus-28-mesh, plus-150		13.5	325	1660	5570
Lead-Zinc	85% minus-200-mesh		13.5	325	1660	5570

*These figures are for cases where the ore itself is being used as the crushing-grinding medium. Where steel or tungsten carbide balls are used capacity is increased as well as power requirements.
Several intermediate mill sizes not given.

"King Size" Power-Shovel Bucket made of J&L HEAT-TREATED JALLOY STEEL still going strong after full year's gruelling service!

J&L STEEL

Performance record on this Marion No. 5561 power shovel proves high-impact and abrasion resistance of J&L heat-treated JALLOY

—40 CUBIC YARDS

of earth and rock in one "scoopful." This monstrous power-shovel bucket excavates 10 acres to a depth of 50 feet *in a month.*

Working *day and night* it removes overburden on a large strip mining operation in southern Illinois. As it digs its way through some 15 feet of limestone, 15 feet of shale and 20 feet of clay, it is subjected *continuously* to severe abrasion and impact.

Yet the J&L *heat-treated* JALLOY STEEL on the bucket *has given more than a year of service!*

To date more than 11,000,000 cu. yds. have been excavated, but the excellent appearance of the J&L heat-treated JALLOY STEEL indicates a reasonable expectancy of *many more* months of service before replacement is necessary.

J&L *heat-treated* JALLOY STEEL was developed for just such uses as this—where steel must withstand extreme abrasion and heavy shock for long periods of time. Its outstanding wear-resistant properties make it especially useful for Scrapers . . . Rock crushers . . . Bulldozers . . . Truck bodies . . . Dump cars . . . Chutes . . . Power-shovel buckets.

Wherever wear and abrasion are limiting factors in the life of equipment, you'll find it profitable to use J&L *heat-treated* JALLOY STEEL. May we send you the booklet mentioned in the coupon?

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☐ Please send me your booklet: "JALLOY—J&L ALLOY STEEL."

☐ Do you recommend Jalloy for:

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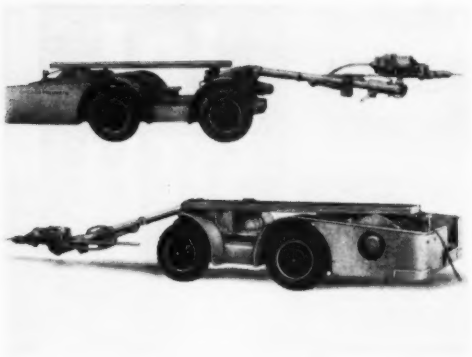
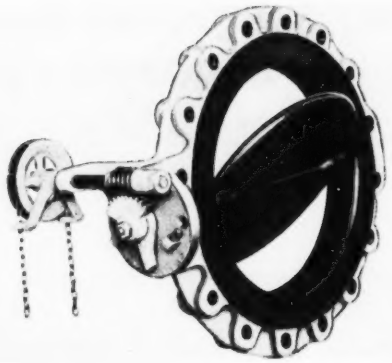
From its own raw materials, J&L *manufactures a full line of carbon steel products, as well as certain products in* OTISCOLOY *and* JALLOY *(hi-tensile steels).*

PRINCIPAL PRODUCTS: HOT ROLLED AND COLD FINISHED BARS AND SHAPES • STRUCTURAL SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS • TUBULAR, WIRE AND TIN MILL PRODUCTS • "PRECISIONBILT" WIRE ROPE • COAL CHEMICALS



THIS ONE-MAN TRAMDRILL drills shot holes up to 4½-in. diameter. Controls are in easy reach of the operator and only 4-in. clearance is needed for drill. Truck has 9-in. road clearance. The unit is made by Chicago Pneumatic Tool Co., N. Y. 17, N. Y.



RUBBER-COVERED BUTTERFLY VALVE made by W. S. Rockwell Co., 200 Eliot St., Fairfield, Conn., has a body and vane covered with latex rubber. It can be used for lines carrying corrosive fluids and gases. Sizes range from 4 to 72 in. for pressures up to 25 psi.

Cuts Case-Hardening Time

Carburit, a paste that does an excellent job of case-hardening without special equipment and does it faster than conventional methods, has been developed by Defnis Chemical Laboratories Inc., 172 Pacific St., Brooklyn, N. Y. A major advantage of Carburit is its ready use for selective case-hardening.

In using it, the section to be hardened is covered with Carburit paste and heated to about 1,700 deg. C. A case .010 in. thick will form in 5 to 7 min., with only 25 to 30 min. needed for a case .040 in. thick. Such a case would require several hours by conventional methods.

The paste dries out when heated becoming brittle and easy to remove. After the paste is knocked off the work is quenched. A furnace or field forge can be used to furnish the heat for the operation.

New Flotation Agents

The Rohm and Haas Co., Philadelphia, has available six new chemicals, two of which offer possibilities as flotation agents. Octadecyl alcohol may be of interest as a lubricant for metal cutting as well as having derivatives applicable to ore flotation. Nonylamine or its chloride, may serve as a cationic flotation agent for siliceous and other negatively charged compounds.

New Drilling Control

A new automatic electronic control regulating the weight on the drill bit in deep well drilling operations, has been announced by Brown Instruments Division of Minneapolis-Honeywell Regulator Co. The system uses a strain gage assembly, an electronic potentiometer as a weight indicator, and pneumatic brakes which maintain the desired weight on the bit.

No Plumb Bob Needed

A new tripod, permitting combined centering and leveling of surveying instruments and equipped with optical plumb indicators has been designed under the auspices of the Royal Institute of Technology of Sweden. Leveling screws for the instrument are provided in the tripod itself.

In principle the design varies from the conventional types in that the axes of the leveling screws are coincident with the longitudinal axes of the tripod legs instead of being perpendicular to the horizontal circle of the instrument. When leveled, the instrument is rotated about a center which is approximately in the center of the triangle defined by the feet of the tripod and nearly on the survey point. Only a slight movement is required to correct for residual error after the instrument is set up over the ground point with the aid of its optical plummet.

BULLETINS

Hydraulic Hose Assemblies. This bulletin published by the Mulconroy Co., 54th and Jefferson Sts., Philadelphia, Pa., contains information on various high pressure, short, hydraulic lines for installation on all types of equipment.

V-Belt Drives. U. S. Rubber Co., Rockefeller Center, New York 20, N. Y., has published a 100-page manual, complete with drive tables and sheave data, to assist engineers in designing V-belt drives.

Wire Cloth. Handbook No. 36, issued by Korb-Pettit Wire Fabrics and Iron Works, Inc., 1505 N. Mascher St., Philadelphia, Pa., contains 48 pages of specifications and illustrations of industrial wire cloth and woven wire screens.

Conical Mills. Bulletin 17-B, just released by Hardinge Co., Inc., 240 Arch St., York, Pa., contains a general discussion of dry grinding, operational tips for improving performance, and several typical dry-grinding layouts.

Compressor Selection. Worthington Pump and Machinery Corp., Harrison, N. J., has available a chart simplifying the selection of the proper size compressor for average industrial uses.

Electric Power. A new booklet, giving information on electric power distribution and protection for open pit mines and quarries, has been announced by Westinghouse Electric Corp., Box 868, Pittsburgh, Pa. Reliable systems are outlined with diagrams and photographs.

Furnaces. Three bulletins put out by Elecktokemisk A/S, 101 Park Ave., N. Y. 17, N. Y., include two booklets dealing with electric pig iron furnaces and calcium carbide and ferro alloy furnaces as well as one bulletin dealing with electric smelter furnaces in general.

Diamond Core Drilling. Bulletin No. 305, published by Sprague and Henwood, Inc., Scranton 2, Pa., gives information on three core drilling machines and some air operated drills.

Freight Rates. This memorandum of increased rates and charges, distributed by Union Pacific Railroad Co., 1416 Dodge St., Omaha, Neb., gives the amount of the increases and the localities affected.

Silicone Rubber. The physical, electrical and chemical resistant properties of G-E silicone rubber and applications for the material are discussed in Bulletin No. CDP-584, issued by the Chemical Dept., General Electric Co., Pittsfield, Mass.

Electric Shovels. A new booklet by the Harnischfeger Corp., 4400 W. National Ave., Milwaukee, Wis., devotes 18 pages to pictures and features of models 1400 and 1600 P&H electric shovels.

Ventilation Recording Gage. A description of the new mine-ventilation recording pressure gage can be obtained by writing to The Bristol Co., Waterbury 91, Conn., for their bulletin 6617.

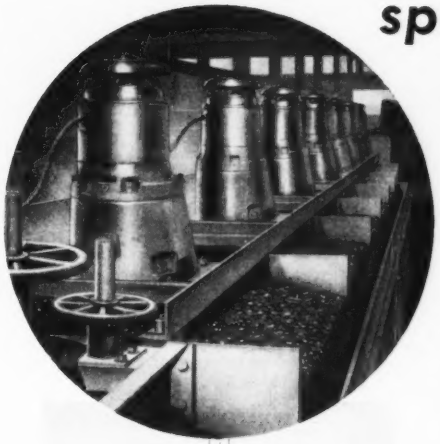
Roller Bearings. The Shafer Bearing Corp., Box 57, Downers Grove, Ill., has issued a bulletin illustrating the features of the new "Microlock" incorporated in their self-aligning roller bearing units.

Diesel Engines. "Diesel Engines and Power Units" is a new booklet containing interesting data and information on diesel engines in general and International engines in particular. Published by the Industrial Power Div., International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

Storage Batteries. Gould Storage Battery Corp., Trenton, N. J., offers a free 40-page booklet of instructions and engineering data on the care of motive-power batteries.

Machine Tool Accessories. Catalog 77-U of the South Bend Lathe Works, South Bend, Ind., gives illustrations and specifications of accessories available to provide lathes and drill presses with a wider range of work.

For greater metallurgical capacity – *specify* FAGERGREN



The Fagergren Flotation Machine handles *more* tonnage with *less* power consumption . . .

HIGHER SPEED OF FLOAT is accomplished by more intense aeration and shallower froth column. Hence, treatment time is reduced (by as much as 50%) and more *tonnage per hour* results.

GREATER RECOVERY of valuable mineral is assured by increased bubble formation and the thorough diffusion of finer bubbles. Alternate compression and expansion of the pulp as it passes through the rotor-stator causes intense aeration and agitation. This action provides more interfaces, and is essential to rapid, efficient mineral separation. The result is improved metallurgical efficiency.

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THE FAGERGREN FLOTATION MACHINE, an exclusive WEMCO product, assures operators of *higher production* per cubic foot of cell volume at *lower cost*.

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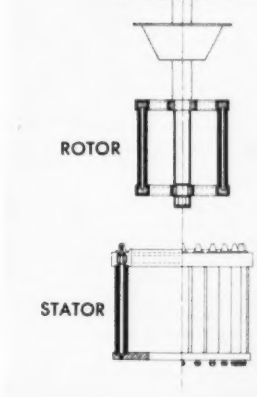

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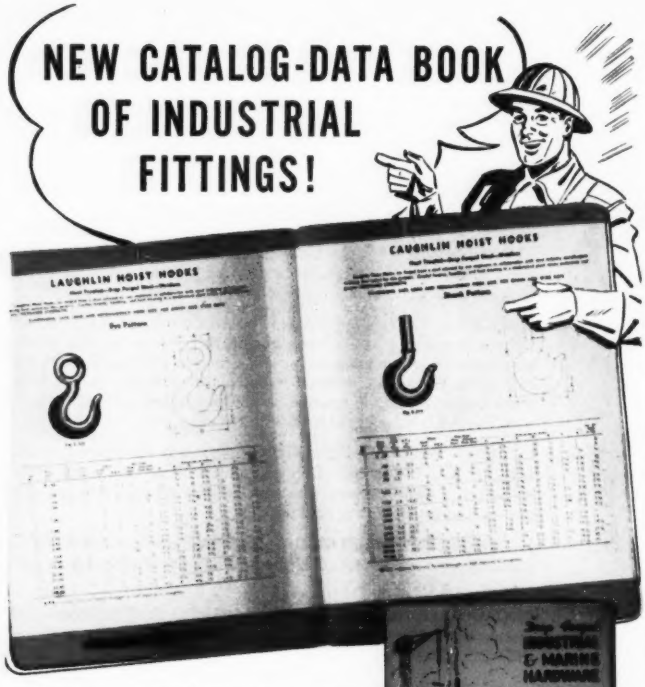

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INDUSTRIAL NOTES

At a recent directors' meeting of the **Ohio Brass Co.** and its subsidiaries, **W. A. Springer** was elected vice president and treasurer of the company, and **Ephraim H. Brown** was elected secretary. Announcement was also made of the appointment of **Louis J. Ott** as general sales manager and **R. A. LeFevre** as advertising manager.

T. F. Rose, Cincinnati branch manager of **Timken Roller Bearing Co.'s Service Sales Division**, has become manager of service and sales of the company's subsidiary in Toronto, Ontario. **H. C. Telford** is the new Cincinnati manager. **Seward T. Salvage** has been made sales promotion manager with headquarters in Canton.

Kempton Dunn was elected vice president and **Cyrus E. Brush**, secretary of the **American Brake Shoe Co.**, according to an announcement by **William B. Given, Jr.**, president.

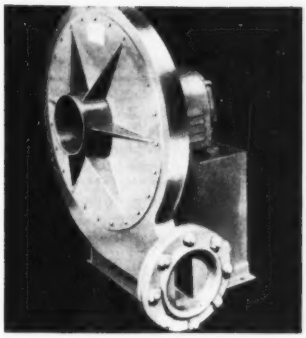
The **Goodman Manufacturing Co.**, Chicago, Ill., has announced the appointment of **Dale Hagenbook** as chief engineer.

George L. Chedsey has been made supervisor of mining equipment for the **Syntron Co.**, Homer City, Pa. **John C. Mitchell** and **F. J. Kirby, Jr.** will take over **Power Tool Sales** in Boston and Cleveland. **E. J. McIlvaine** and **A. C. Staley** have been appointed as junior salesmen.

The appointment of **Paul F. Preston** as chemicals division manufacturing manager for **General Electric Co.'s** chemical department, has been announced by **J. L. McMurphy**, division manager.

Dr. G. V. Slottman is now director of research and engineering for **Air Reduction Co.**

Marvin Wall has been made sales



TURBO-PRESSURE BLOWER, made by Chicago Blower Corp., Chicago, Ill., has application in industrial furnaces and where nonpulsating air pressure is required. Flanged discharge is special feature.

engineer in the Southwestern Territory for **Nordberg Manufacturing Co.**, Milwaukee 7, Wis.

The **Dorr Co.**, New York has named **Sociedade Technica e Comercial Serva Ribeiro S/A**, Sao Paulo, Brazil, its exclusive representative in that country.

Edward F. Fisher has been elected president of **Gar Wood Industries, Inc.**, Wayne, Mich.

Sam Tour & Co., Inc., has announced the reorganization of their Mechanical Engineering Department under the supervision of **John J. Meadows.**

Minneapolis-Honeywell Regulator Co., has entered an agreement for the acquisition of the assets of **H. Belfield Co.**, manufacturers of control valves. **Howard L. Murray**, president of Belfield will be elected vice president of the parent company.

Richard H. Koehler has been appointed advertising manager of the **Stearns Magnetic Mfg. Co.**, Milwaukee, Wis.

Kennametal, Inc., Latrobe, Pa., has moved its New York office to 11 West 42nd St. Recent appointments include those of **C. Russell Miller**, service engineer, Cincinnati; **Henry B. Worthington**, sales engineer, Springfield, Mass.; **Thomas J. Kniff, Jr.**, application engineer, Philadelphia; **James V. Wilcox**, Provo, Utah; and **Jason C. McGuire**, Eastbank, W. Va.

William A. Schaub and **Raymond P. Russell** have been named managers of the Denver and Boston districts respectively, of the Industrial Products Sales Dept. of the **B. F. Goodrich Co.**

R. S. Bradley has been promoted to Director of Research and Engineering at the **A. P. Green Fire Brick Co.**, Mexico, Mo.

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PERSONAL NEWS

PARTICIPANTS IN A SYMPOSIUM on national mineral policy held during the 77th annual meeting of the AIME in San Francisco, Feb. 13-17, were Richard Lund (left), supervisor of engineering economics at Battelle Memorial Institute, who spoke on stockpiling, and Otto Herres (right), vice president of Combined Metals Reduction Co., Salt Lake City, whose subject was "How Can the Domestic Mining Industry Be Strengthened?"

Charles Will Wright, consultant for Westinghouse Electric International Co.'s special projects division, is located at 2540 Massachusetts Ave., Washington 8, D. C. He is also giving part time to the Industry Division of the Economic Cooperation Administration.

John E. Bowenkamp, mine examination engineer for Wellington Explorations, Ltd., has returned to Colombia after a two-months' trip to the United States and Canada.

J. M. Kerns, former general superintendent, Nevada Minerals Co. and the Lady Esther talc mine, which company was recently sold to the Sierra Talc & Clay Mine, Los Angeles, Calif., now resides at Big Pine, Calif.

A. L. Hayes, former superintendent of the Empire Zinc Co., Hanover, N. M., has been transferred to the New York office of the New Jersey Zinc Co., where he will assist the general manager of mines. **S. S. Huyett** succeeds him at Hanover.

William J. Pearce, mining engineer, has accepted a position as field engineer with Stone & Webster Engineering Corp., Dunkirk, N. Y., where a steam-electric power plant is being built for the Buffalo, Niagara Electric Co.

Alan F. Matthews, editor of the U. S. Bureau of Mines *Minerals Yearbook* and author of the *Yearbook's* chapter on uranium and thorium, recently delivered a lecture on uranium and thorium industries supporting atomic energy at the School of Mines, Columbia University, as part of the minerals economics course.

P. K. Richardson, power engineer, American Smelting & Refining Co., was recently in London for consultation regarding a construction problem at the copper smelter at Mount Isa, Queensland, Australia.

Frank Cameron has replaced **John Park,** resigned, as general manager, Saudi Arabian Mining Syndicate, Ltd. He left for Saudi Arabia in February to take over his new duties.

Howland Bancroft, who has spent the last 18 months in South and South West Africa with headquarters in Tsumeb, returned to the United States March 7th. For the next few months he will be engaged in an investigation following which he will return to South Africa, with headquarters in Johannesburg.

Ray D. Nolan, director of the Minnesota State Division of Lands and Minerals, has announced the following promotions following the death of **Howard V. Reusswig,** assistant chief mining engineer: **Roy C. Pascoe,** district engineer on the Cuyuna range and lake-bed district, to succeed Mr. Reusswig; **W. J. Dwyer,** district engineer on the eastern Mesabi, to general district engineer in charge of field inspection on all three ranges. **Peter A. Stark** succeeds Mr. Dwyer as district engineer and **B. J. Nicholson, Anthony T. Vellella** and **Donald Mellem** have been appointed district mining inspectors. All the new appointees will be located at the state's headquarters in Hibbing, where **H. A. Lever** is chief mining engineer.

Captain John H. Dunstan, who had served at the Jackson, Negaunee, Imperial and Salisbury mines in Michigan, has been retired by Cleveland-Cliffs Iron Co.

Lyle R. Meyers, field geologist with Pickands, Mather & Co. in the Iron River district, Michigan, has resigned to accept a position with the Northern Pacific R. R. He will be located at Billings, Mont.

D. F. Haley, vice president, Climax Molybdenum Co., has retired.

Dr. Courtney E. Cleveland, former head of the exploration department, Bralorne Mines, Ltd., has resigned to become chief geologist for Barnsdall Oils, Ltd., of Calgary, the Canadian outlet for Honolulu Oil Corp. and the Barnsdall Oil Co., in the U. S.

HARVEY S. MUDD

Harvey S. Mudd, president and managing director of Cyprus Mines Corp., will receive the Egleston Medal, awarded annually by Columbia University Engineering School Alumni Association for distinguished engineering achievement, on April 28. A former president and director of the AIME, Mr. Mudd has been active in the development and management of important copper mines in the Island of Cyprus for many years.

George Adams Ellis, president, Vermont Copper Co., has been named head of the Northeastern Mining Association, which was organized in January to help develop and utilize mineral resources, particularly in New England and New York State. **Allen L. Hearst** of Bristol, Conn., was named secretary-treasurer.

Anton Tancig, general mechanical superintendent for Snyder Mining Co.,

Chisholm, Minn., on the Mesabi Range, was presented with a gold watch at the company's headquarters in Pittsburgh recently in recognition of 40 years' service with the company.

Donald L. Masson, acting director of the School of Mines, Washington State College, Pullman, has been named to the program committee for the 1949 American Mining Congress meeting to be held in Spokane in September.

Colin Campbell has been appointed assistant to mine manager O. R. Rockwell of Calumet & Hecla Cons. Copper Co. **Henry M. Haskell** has been made engineering assistant to **H. L. Williams,** production manager.

Frederick W. Denton, Jr., production engineer for Oliver Iron Mining Co., Ironwood, Mich., has been made assistant superintendent of the company's Geneva mine. **Harry W. Byrne** is superintendent of the Oliver's Ironwood operations. Mr. Denton was formerly general superintendent of Copper Range Co.

K. PETERS

K. Peters, formerly manager in charge of mining and milling operations of the Mahad mine of the Saudi Arabian Mining Syndicate, Ltd., has been appointed consultant on mining affairs to His Excellency Shaikh Abdulla Sulaiman, Minister of Finance, Saudi Arabian Government, with headquarters in Jedda, Saudi Arabia.

Fletcher W. Rockwell has resigned as chairman of the board of the National Lead Co. Mr. Rockwell was president of the company from 1938 to 1947. His father was one of the founders of the National Lead Co.

Behre Dolbear & Co., New York, has been appointed by the Government of the Union of Burma as general consultants and technical advisors on minerals.

W. F. Brazeau, president of the International Selling Corp., is president of the newly formed Intsel Metals Corp., 70 Pine St., N. Y. The new company has been formed to deal in non-ferrous metals, steel, ores, minerals, ferro alloys and scrap. Other officers are: **Sylvan Gotshal,** chairman of the board; **J. E. Vincent,** vice president; and **Carl Bauer,** secretary-treasurer. Directors are the officers and **Edward A. Behr,** formerly assistant sales manager of the American Smelting & Refining Co.

Dr. Frank L. Stillwell has been awarded the Australian Institute of Mining & Metallurgy medal for 1948 in recognition of his contributions to the geology of many Australian mineral fields and to the science of mineragraphy. He is in charge of the mineragraphic investigation work at the Commonwealth Council for Scientific and Industrial Research.

Carl Trischka, former chief geologist at the Copper Queen branch of Phelps Dodge Corp., has resigned to devote his time to research among pre-historic cultures and as a consulting engineer. **William G. Hogue** replaces him.

Dr. William Hume-Rothery has been awarded the Institute of Metals (London) Medal for 1949, in recognition of his outstanding contributions to the science of non-ferrous metallurgy.

Irwin H. Cornell, who retired as vice president and sales manager of St. Joseph Lead Co. last May, has been named vice president of the Cornell Iron Works, Long Island City, N. Y. Mr. Cornell was associated with the company in 1910 before joining St. Joseph Lead Co.

Gyle B. Pyles, former superintendent of maintenance for Oliver Iron Mining Co.'s Hibbing-Chisholm district, has been appointed project engineer. **C. R. Burton** succeeds him. **J. R. Schoenig** has been transferred from the company's Duluth general offices to the Hibbing-Chisholm district to become assistant superintendent of maintenance. **James S. Steel** has been appointed field supervisor of explorations in the company's mining engineers department.

R. S. Woodford has been appointed general superintendent of the Alberta nitrogen department of the Consolidated Mining & Smelting Company of Canada, Ltd. Mr. Woodford, who, prior to the appointment, held the position of assistant general superintendent, takes over the duties of **D. D. Morris.** Mr. Morris was recently named general superintendent of the research and development division of the company.

David W. Boise, plant comptroller at Chino mines, Kennecott Copper Corp., since 1924, has retired after 43 years of service in the industry. He will remain in an advisory capacity for Kennecott and is residing in Silver City, N. M.

Walter Chatfield Page, assistant to the vice president and general manager of Western operations for United States Smelting, Refining & Mining Co., has been named assistant general manager. He will continue to supervise smelting and refining at the company's Midvale, Utah, plant.

C. J. Parkinson, Salt Lake City, has been named vice president and director of Dragon Consolidated Mining Co., an affiliate of North Lily Mining Co., and Anaconda Copper Mining Co. He replaces **W. Q. Van Cott.**

Charles S. T. Farish, formerly superintendent of Cerro de Pasco Copper Corp.'s property at Casapalca, has been made general mine superintendent of all Cerro de Pasco mines. **James W. Lavin** succeeds him at Casapalca. **Joseph O. Hosted,** superintendent of Cerro de Pasco, resigned in February, after 29 years with the corporation. **Karle Wolfe,** former assistant superintendent, succeeds him.

Frank E. Cash, supervising engineer, U. S. Bureau of Mines, Duluth, has been transferred to College Park, Maryland, on special assignment in the safety branch. **John A. Johnson** will serve as acting supervisor of the Duluth station.

THADDEUS S. ULLMANN

Thaddeus S. Ullmann, formerly with the New York Division of Eimco Corp., has been appointed assistant manager export department of the Eimco Corporation of Salt Lake City, manufacturers of mining equipment. Mr. Ullmann has had vast experience overseas in metal ore and coal mining. During World War II he served on various economic and diplomatic posts connected with Allied war effort and was decorated by H. Ch. M. Sultan of Morocco with the Commander Star of the Ouissam Allaouite.

William F. Boericke, mining consultant for Hayden, Stone & Co., visited the Getchell mine in Nevada, accompanied by **Roy C. Hardy,** consulting engineer for Getchell.

Enoch Perkins, vice president, Mutual Chemical Co., has recently returned from a business trip to Johannesburg, South Africa.

John J. O'Shea, Jr., mining engineer, has been appointed assayer in charge of the laboratory of the Alaska Territorial Department of Mines at Anchorage. He has been employed by the Fairbanks Exploration Co. as foreman of the gold room.

THE CHARLES A. GRIMES MEMORIAL SCHOLARSHIP, established recently at the Colorado School of Mines as a memorial to the 1940 graduate who lost his life while serving with the U. S. Army Air Forces during the war, has been awarded to Wallace Arnold (left), of Canon City, Colo. The four-year award, made on the basis of financial need and scholastic ability, may be used to pursue any of the courses offered by the college. Shown with Arnold are Max Grimes, general manager of Morse Brothers Machinery Co., and Harold N. and Raymond L. Grimes, his sons.

LETTERS

Copper Error

To the Editor:

In reading over my letter published on page 107 of your issue of January, 1949, I note a substantial error in my statement of copper premiums actually paid compared with those which might have been made. The error lies in the statement that the maximum subsidy allowable to any individual producer was 15c. a pound of copper. This was not the case. The copper mines were classified into two categories: "Major Coppers" eligible for a 5c. premium only, on a part or all of the production; and "Minor Coppers," eligible for premiums between 5c. and 15c. Grouping the two, of course, weights the scales heavily toward the major copper premium of a flat 5c. I regret the error.

Since there were no such classifications of lead and zinc mines, the discussion of those categories is correct.

For copper mines, a better comparison can be found between the premiums actually paid to copper mines with revised quotas and the maximum premiums which the administrators might have caused to be paid to those mines through the revision of their quotas. This comparison can be derived from my article "Production Costs Under the Premium Price Plan" in your issue of July, 1947. Thus, for 1942-3-4:

Copper Mines	Tons Copper Produced	Cents Per Pound Copper: Av. Max. Prem. Available	Cents Per Pound Copper: Premium Actually Paid
Medium-sized	884,000	5.0c.	1.89c.
Small	122,500	12.8c.	6.29c.

Chevy Chase, Maryland JESSE L. MAURY

Premium Price Plan

To the Editor:

I am a graduate mining and metallurgical engineer, and I have taken considerable interest in ways and means of increasing our reserves of ores and minerals. Government incentive payments seem to me to be the most plausible means of doing this. However, a straight subsidy on marginal ore is very wasteful. Exploration for new ore deposits should be our aim, and not depletion of present marginal ore deposits.

An article in the December, 1948, issue of *Engineering & Mining Journal*, by Olund and Gustavson, does not give a true presentation of the results of the Premium Price Plan. A comparison of present market prices with former market-plus-premium figures is of no value whatever. What is important to the metal producer is the amount *he receives for his ore* and this amount is much less than the market price of metal content.

For example, let us consider the small producer who got total premiums of 8½c. per lb. of metal produced, shipping his oxidized zinc ore to the smelter at Tooele, Utah. The smelter paid only 44% of the market price for 75% of the zinc content, or 2.8c. per lb. of zinc on an 8½c. market. The producer received the sum of approximately 11⅓c. per lb. for his zinc. In addition to this, he had to pay a smelting charge of about $13 per ton of ore plus freight and hauling fees.

Under the present market of 17½c. per lb., the producer receives only about 6c. per lb. of metal in his ore and still pays all of the other charges plus increased labor and material charges. As a result, he cannot operate and his mine is closed. The important thing about premiums to the producer is that *he received them directly* without the smelter taking out the lion's share first. A similar situation applies to all ores purchased by the smelters.

Most of the mines in Nevada who were operating under the Premium Price Plan were small independent outfits. Out of 303 who were getting this aid, 297 were closed within three months after the expiration of premiums in June, 1947. Most new mineral deposits are found by small companies operating on very limited venture capital; large corporations cannot afford to do the necessary prospecting and exploration. In fact, much more is lost by investors in small mines than is gained. It takes a lot of hard work and optimism and sticktoitiveness to make a new mine.

It is imperative that some sort of incentive payment plan be worked out if our natural resources are to increase. The emphasis must be on new deposits. I would suggest a sliding scale plan of incentive payments, the premium per lb. being decreased as production increases. An upper limit of 5,000,000 to 10,000,000 pounds of metal annually eligible for premium payments would also be advisable. (To each producing company.)

PAUL E. LYON, JR.

Salt Lake City, Utah

OBITUARIES

Dr. Bailey Willis, emeritus professor of geology at Stanford University, died Feb. 19 in Palo Alto, Calif. He was an internationally known seismologist and geologist, a member of the National Academy of Sciences, and the winner of many honors and decorations. In 1915 Dr. Willis became head of the geology department at Stanford, which position he held until his retirement in 1922. He was 91.

William J. Meredith, 81, retired

A thousand times the force of gravity
Yanks the slimes out of your flotation feeds
The Bird Centrifugal Classifier effects clean, sharp cuts as fine as one micron if desired.
★ ★ ★
Chemical dispersion is generally unnecessary; cell capacity is increased; reagent cost is reduced.
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Slurries at ball mill consistency are handled without dilution in many cases.
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When it comes to scalping, you can depend on a Robins Gyrex Screen.

Take the load of sand and gravel you see above, for example. It's full of lump rock. But that Robins Gyrex Screen is quickly scalping off the oversize . . . feeding sand and gravel onto the conveyor below.

This screen is a real *cost* scalper, too!

Maintenance costs are lower. Robins Gyrex Screens have precision roller bearings, protected by labyrinth seals to maintain ample lubrication and protect against the entry of foreign particles. Thus you are assured of continuous service.

Screen cloth life is longer. These screens give you a drum-tight, rubber-cushioned screen cloth mounting to prevent loosening, whipping and crystallization. This assures you of getting equal efficiency from every square inch of the screening surface. And, when necessary, you can change the cloth simply and easily.

Why not find out how Robins Gyrex Screens can help you size rock, sand and gravel more accurately, more economically? They are made in a choice of floor-mounted or suspended types—in a wide range of sizes and styles to fit your every screening operation. Write today for details.

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SEND TODAY for your copy of Robins Bulletin 115-A. This bulletin is completely illustrated and describes the outstanding features, advantages and benefits of money-saving Robins Gyrex Screens. Address your request to Robins Conveyors Division, 270 Passaic Ave., Passaic, N. J.

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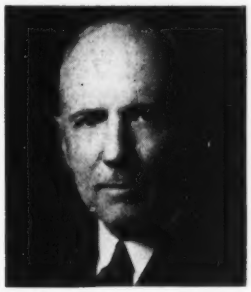
Personal News *(Continued)*

mining engineer, died Jan. 30 at Puyallup, Wash.

Walter R. Alexander, 59, mining engineer of Seattle, Wash., died Jan. 30 after a long illness. He was associated with mining interests in Washington and was also well known in Idaho, California and Alaska.

James B. Thorpe, vice president, secretary and treasurer, and a director of Climax Molybdenum Co., died in January. He had served in various capacities with the company since 1926.



A. E. DRUCKER

A. E. Drucker, 72, dean emeritus of the School of Mines and Geology, Washington State College, Pullman, died Feb. 2 at his home in San Diego. Noted in the Northwest for his light metals research work, he was associated with the college from 1926 until his retirement in 1945. He urged the development of aluminum and magnesium plants in the northwest area.

Lawrence G. Stelzle, president of Walter Motor Truck Co., died Feb. 12.

M. W. Latimer, 61, manager of the Hercules Powder Co. office in Joplin, Mo., died suddenly at his home, Feb. 23.

Eric Burkman, secretary of United States Rubber Co., died Feb. 26, while on vacation in St. Thomas, Virgin Islands. He was 56.

A. S. Hersov, chairman and joint managing director of the Anglo-Transvaal Consolidated Investment Co., Ltd., died recently. He was 53. He was a mining engineer and worked underground before becoming interested in the business and investment activities about 18 years ago.

William Harvey Emmons

William Harvey Emmons, professor emeritus of geology at the University of Minnesota, who died at his home in Minneapolis on Nov. 5, was born at Mexico, Mo., graduated from Center College, Missouri, and worked for the Ph.D. degree at the University of Chicago where he was a research assistant to Professor T. C. Chamberlin and studied under such eminent men as Salisbury, Weller, Iddings and Penrose. He joined the U. S. Geological Survey and worked under Whitman Cross and later Lindgren, Ransome and others. He often paid tribute to the training he received on the Survey and the privilege of working with the pioneers in economic geology in this country.

It is difficult to write an appreciation of Dr. Emmons because he accomplished so much in so many aspects of geology. However, his primary interest was in the geology of the metallic mineral deposits, including the training of young men in that field. The tremendous energy thrown into this work is indicated by the number of districts studied in the first few years of his work on the Geological Survey. The list includes San Juan, Colo.; Phillipsburg, Mont.; Bullfrog, Nev.; Ducktown, Tenn.; Maine, New Hampshire, and others. His crowning achievement while on the Survey was the elaborate summary on secondary enrichment that first appeared as Bulletin 529 and a revision as Bulletin 625. While carrying on this work he was called to Chicago in 1907 to teach petrology and economic geology.

In 1911 Emmons became professor and head of the department of geology, and also director of the Minnesota Geological Survey, positions he held until his retirement in 1944. This gave him an opportunity to teach young men, imparting to them some of his own enthusiasm for geology. That he was successful is evidenced by the number of prominent geologists who were his former students. At one time either the president or president-elect of all three major geological societies were on this list. Only a portion of his boundless energy went to his duties as teacher and director, the excess overflowed into a never-ending stream of papers and books. "Principles of Ore Deposits," "General Economic Geology," "Petroleum Geology," "Gold Deposits of the World," and a general text prepared in cooperation with three of his co-workers are his monuments.

At intervals during this time Professor Emmons traveled far and wide on consulting work. Most western states and Tennessee were included in this list as well as Manchuria, Argentina, Mexico and Canada. He also spent some time in Europe at the time of one of the sessions of the International Geological Congress. It was on these travels, as well as on field trips to the Black Hills with his classes, that the delightful personality of the man was best revealed. He was a most entertaining conversationalist and everywhere he went was counted as a friend. In spite of his achievements he was modest, loyal to his associates, and reluctant to think ill of anyone. His passing leaves a gap that cannot be filled.

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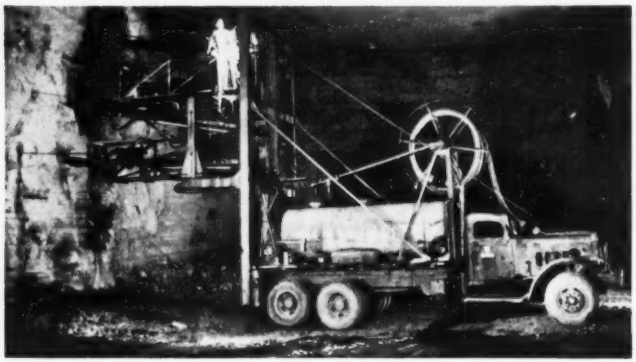
REGIONAL NEWS



TWO MINERS OPERATE jumbo drilling equipment for U.S. Bureau of Mines at government shale operation near Rifle, Colo. With the four-drill equipment, eighty 15-ft. holes are drilled into the shale in one shift. (U.S. Bureau of Mines Photo.)

COLORADO

Mines on Cripple Creek working in good ore—Oil company reports new shale process for high-grade fuel

★The Cresson mine at Cripple Creek is in better shape now, regarding ore for shipment, than it has been since the war, according to Wesley Moulton, superintendent of the mine. He reports that six sets of lessees and the company are working in nice ore now, and they will have ore ready for shipment immediately following the opening of the mine after the new Carlton mill is built.

★Shipments of gold ore from the Bob Tail vein on the 28th level of the Golden Cycle Corp.'s Ajax mine during the month of January were exceptionally fine, according to a statement made by Charles H. Carlton, superintendent of the property. One 35-ton car shipped from the 27th and 28th levels on Jan. 26 settled for 16.28 oz. of gold per ton. On the same day a 20-ton car of coarse rock was shipped to the Golden Cycle mill in Colorado Springs and this will settle for approximately 8 oz. of gold per ton.

★Union Oil Company of California scientists report perfection of a process which turns the liquid from shale into higher-grade aviation, diesel and jet fuel than is being obtained from underground crude. The patented process requires water. Construction of a commercial-size plant will start as soon as the firm is assured of enough money to do the job. These facts were given to the Grand Junction Chamber of Commerce by Tell Ertl, engineer for Union Oil.

★Chain-O-Mines Operators, Inc., under the direction of Dr. William Mark Muchow, president, has completed the first unit of its Gilpin County mill, which he says will have an ultimate capacity of from 6,000 to 10,000 tons per day. Future plans call for the installation of an underground crusher connected by belt conveyor to the mill bins on the surface. The ore contains gold, silver, lead, zinc and copper.

★Lupton Mining Co., Inc., is operating in Clear Creek and Gilpin Counties and producing lead and zinc, with gold and silver. Steady 24-hour operation of the Grizzly mine on Mount Kelso in the Argentine district is reported. The company also operates a 75-ton selective flotation mill at Georgetown, milling ore from its Griffith, Moline and Grizzly mines. Plans for early 1949 include a tunnel beneath the present level at the Grizzly mine for approximately 1,000 ft. Since the beginning of its operations early in 1945, the Lupton company shipments have averaged from $10,000 to $20,000 per month.

★The Front Range Mines, Inc., operating the Strong and Mary Cashen mines in the Cripple Creek district, worked continuously during the past year carrying on an expanded program of development. A large body of low-grade ore was opened from the 1,500-ft. level. The Little Mattie mine near Idaho Springs was developed through the Newton tunnel and shaft. In Boulder County the Melvina shaft was unwatered from the 585 to the 700-ft. level. Ore above the 700-ft. level averaged $126.32 per ton gross.

★Good ore is now being mined by all lessees on the Mollie Kathleen mine at Cripple Creek and operations will not be discontinued immediately following the shutdown of the Midland Terminal Railroad, according to Lee Brown, mining superintendent for the Markley Mining and Exploration Co., operators of the property.

★Vernon B. Pratt, for the past two years engineer geologist for the Callahan Lead-Zinc Co. at Whitepine, has resigned to take over the management of the California mine near Lake City, recently purchased by Mr. Pratt and R. J. Flynn. Mr. Flynn will remain in his present capacity as assistant superintendent of the mine at Whitepine.

★The Akron Unit of Callahan Zinc-Lead Co., Gunnison County, has been awarded a safety plaque for having the best safety record of any underground mining operation in the state of Colorado, during the year 1948.

★In the Boulder tungsten belt, the Firth-Sterling Steel Co. has continued development on its Hurricane Hill tunnel at Lakewood, and extended the workings by approximately 200 ft. of drifting and 250 ft. of raises. Ore produced is treated in the Wolftongue mill at Nederland. William Loach is in charge of all Firth-Sterling properties. George H. Teal operated his mill in Bummer Gulch and, during the latter part of the year, became the only buyer of tungsten in the district. Drop in the price of tungsten has curtailed operations along this line.

★It is reported that the Anaconda Copper Mining Co. is securing mining properties in the Aspen district. An extension of one of the old bonanza orebodies has been discovered. During the summer a small gravity mill was built by Anaconda and operated by Herron Brothers, to sample dump material.

★The Hill Top mine and surrounding claims in the Horseshoe mining district southeast of Leadville has been acquired by the Leadville Lead Corp. It is understood that the Dauntless tunnel on the eastern slope will be driven through the range to the Lake County side and connect with the Hill Top shaft workings. A truck road from Leadville to the west portal site is also proposed.

★Kennecott Copper Corp. has contracted with Joy Manufacturing Co. to make core-drill tests on Porphyry Mountain at Jamestown, possibly to 500 ft., to test gold content of a monzonite deposit and investigate the possibilities of other minerals. Some of the cores have indicated the presence of small amounts of copper, fluorspar and iron sulphides.

★The Timberline Milling Co. has pilot milling operations under way at the Cloud City plant leased by the new company until June, 1949. If testing of carbonate lead-silver material from the Hibschle and McKane mine dumps prove satisfactory, construction of a 200-ton milling plant will be considered. T. T. Biddle is consulting metallurgist and Stanley Walker, mill superintendent.

★Gold receipts in January, 1949, at the Denver mint totaled 34,850.587 oz. valued at $1,219,770.57, according to Moses E. Smith, superintendent. Receipts for January, 1948, amounted to 44,756.795 oz. valued at $1,566,489.86. January silver receipts came to 9,894.35 oz. worth $8,681.66 compared with 11,167.4 oz. worth $9,890.99 for January, 1948.

UTAH

Park Utah Cons. company discovers lead-zinc-silver ore—Silver King Coalition shows profit for 1948

★Hindered by record-breaking storms following the end, Feb. 3, of the three-month-long strike against Kennecott Copper Corp.'s Utah Copper division, operation of the huge open-cut mine, mills and related industries neared normal during the month of March.

Representatives of the company and of the Brotherhood of Locomotive Firemen and Enginemen were to meet late in March with a three-man fact-finding board which is to recommend terms for permanent settlement of the dispute.

Meanwhile, construction continues on the new $16 million electrolytic copper refinery of Kennecott at Garfield. Brick work is well under way and 213 tons of reinforcing steel and 510 tons of structural steel had been used during winter months.

Initial capacity of the refinery will be 12,000 tons of copper per month, cast in the form of wire bars, which are used for manufacture of copper wire.

An anode casting plant, to furnish anodes for the refinery, will cost $3 million, with Kennecott sharing cost with American Smelting & Refining Co.

★An election to determine whether 13 signal operators and yard foremen at Kennecott's Bingham mine shall be represented by the Brotherhood of Locomotive Firemen & Enginemen has been ordered by the National Labor Relations Board. The Brotherhood's request for the election was opposed by the company which held that the 13 men, in effect, are foremen.

★Collective bargaining relations between International Union of Mine, Mill & Smelter Workers and Kenne-

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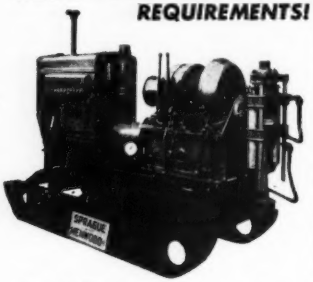

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Utah *(Continued)*

cott Copper Corp. were discussed at a two-day MMSW Kennecott Council meeting Feb. 15-16. No announcements as to findings came from Reid Robinson, Chicago, or Orville Larson, Globe, Ariz., vice presidents who attended, or from Vern B. Reese, Magna, meeting chairman.

★Park Utah Consolidated Mines Co. has uncovered an important orebody, below the 1,500-ft. level during an eastward extension in the Ontario mine, Park City, Paul H. Hunt, manager, has reported.

Miners cut into ore running approximately 38% lead, 16% zinc and 12 oz. silver to the ton. Mr. Hunt said the 1,500 level ore is somewhat similar to that found on the 1,600 level during exploratory work the past year. The company is trying to establish whether there is a connection, anticlinal or otherwise, between the two discoveries.

★The newly-completed plant of Morris P. Kirk & Son, Inc., in Salt Lake City will produce antimonial lead, pig and caulking lead, type-metals, solders and babbitt metals and will serve as distributing point for lead pipe, lead sheet, aluminum alloys and other products of National Lead Co., of which the Kirk firm is a subsidiary.

★Utah railroads have petitioned the State Public Service Commission for an increase in rates on iron ore moving within the state comparable with that authorized by the Interstate Commerce Commission for interstate shipments.

Last December the Utah commission authorized an increase of only half the amount approved by the ICC.

★Equipment for the Vanadium Corporation of America's new $50,000 mill for treating complex copper-uranium ores has been ferried across the Colorado River to reach the site at the mouth of White Canyon, San Juan County. The ferrying operation and a route by way of Greenriver, Utah, was utilized because of primitive roads and unfavorable weather conditions, reports A. L. Chaffin, Hite, Utah.

★Output of the Bonneville, Ltd., plant near Wendover last year totaled 60,000 tons of potash and 60 persons were employed there, Tooele Chamber of Commerce members were informed during a recent tour of the plant. Blair Lamus, plant superintendent, explained how brine which seeps into canals is mixed with salt and then pumped from one canal to another until water has been evaporated. The crude material, roughly 30% potash and 70% salt, is crushed in the milling plant. Potash is separated and sent to southern and midwestern markets as fertilizer and the salt is hauled away as waste.

★A hearing before a Department of Commerce appeals board was expected to open the way for J. R. Simplot to obtain scarce anhydrous ammonium to operate the superphosphate fertilizer plant near Salt Lake City, formerly known as the Kalunite plant.

A law was passed by the last Congress allocating 10% of the Army's anhydrous ammonium to fertilizer plants. Previously the Department has held that production could go only to plants existing at the time the law was passed.

★Silver King Coalition Mines Co. earned a book profit of $137,647 in 1948, compared with a loss of $61,764 in 1947. Ore mined was 52,012 tons, yielding gross returns of $2,108,970. Tonnage in 1947 was 42,012. During the year 22,977 ft. of exploration and development was done.

★U. S. Bureau of Mines statistics released in Salt Lake City show a substantial boost in iron ore production in the state, credited to demands of the Geneva Steel Co. plant at Provo and the Kaiser furnaces at Ironton. Utah's 1947 iron ore output was set at 2,823,853 gross tons as against 3,171,000 gross tons in 1948.

ARIZONA

★Reactivation plans of the Sunset Mining Co. near Superior in Pinal County call for unwatering the lower half of the 610-ft. Sunset shaft and purchase of more adequate machinery and equipment at the shaft collar. Operators plan to drive at least another 300 ft. in and around the Sunset vein, and conduct further diamond-drill exploration to prove up orebodies in depth in the Sunset vein and the Stanley vein which intersects it,

★Applications for purchase of Magma Copper Co. stock have been filed with the Securities and Exchange Commission by the Newmont Mining Corp. and Lazard Freres and Co. Magma is offering 204,000 shares of common stock as part of the development of its San Manuel Copper Corp. properties. Newmont asks 14.9% of the common stock and proposes to contract up to one-half of the Magma issue not purchased by other stockholders. Lazard Freres agrees to purchase the rest of the unsubscribed issue.

★A bill to curb stock sales and provide for strict enforcement has been introduced in the 19th Legislature. The measure was prepared by a securities advisory committee appointed by the Corporation Commission.

The measure sets up appointment of a qualified person at a $6,000-a-year salary and provides for an assistant. It would increase from $10 a day to $25 a day the assessment against a stock selling company for surveys of its corporate setup and program.

NEW MEXICO

I. M. & C. Corp. refinery costs $1,500,000—Potash Co. of America completes many improvements

★Freight rate increases put in effect last August and again this winter have caused marked reactions in the non-metallic mining industry in New Mexico. The potash mines near Carlsbad are increasing their refinery capacity by from 30 to 40%. The Zuni Milling Co. is shipping its high-grade fluorspar from its refinery at Los Lunas at no less than 97 to 98% purity and guaranteed to contain no moisture. It formerly shipped some 95% spar and all with 3% moisture. Pumice Aggregate Sales Corp., of Albuquerque, producing 20,000 cu. yd. of aggregate monthly, is doing research on finished products.

★International Minerals & Chemical Corp., Carlsbad, put a $1,500,000 refinery addition in service in February to produce a new chemical grade of potassium chloride and an improved agricultural potassium sulphate.

★Potash Company of America, Carlsbad, is completing a $4-million expansion and improvement program started early in 1948 and expects to increase its output of refined products by 50%. Some improvements were: a 26-mile pipe line for fresh water supply; a new No. 3 shaft; addition of two large grinding mills, a new Symons cone crusher, six new cooling agitator plants, a new 24-cell flotation section, new 1,000-hp. hoist for No. 1 shaft, three new 14 BU Joy loaders, a new Goodman 512 Shortwall undercutter, three new 300 man-trip cars, new all-steel rotary dump cars and a new large tank for acid storage.

★The United States Potash Co., Carlsbad, is preparing to start construction on a $1-million addition to its refinery to increase output of chemical grades by 25%.

★The Zuni Milling Co. has recently completed two new incline shafts for its No. 21 fluorspar mine near Grants, N. M. One is equipped with belt conveyor, the other skip and hoist. The company is continuing development work and stockpiling ore. George A. Warner, general manager, notes a shortage of miners. He could use 25 or more men in addition to present employment of between 50 and 60.

★Pumice Aggregate Sales Corp. has recently added two new crushers, locally built.

★General Thomas D. Campbell, of Montana wheat-growing fame, is doing mineral exploration work on his La Joya and Belen grants in central New Mexico, where a good showing of bentonite has been found; on his San Pedro grant near Albuquerque, a deposit of barite has been discovered.

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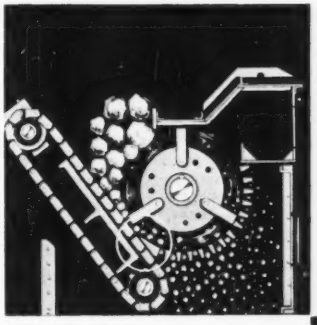

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CALIFORNIA

Metallic ore mined was down for last year; lead, zinc values up—Some nonmetallics show increase

★The total value of mineral production of California for 1948 is estimated at $1,099,704,000 by the statistical department of the Division of Mines. This is an increase of about $245,590,000 over the 1947 total, resulting from peak production of petroleum and natural gas coupled with record high prices.

All metals registered a decrease in quantity of ore mined, but the value of lead and zinc was slightly higher than that of 1947. Cement, miscellaneous stone, salines and some industrial minerals registered increases both in quantity and value. Estimated quantities of metals produced during 1948 are as follows: gold, 418,490 oz.; silver, 685,200 oz.; copper, 900,000 lb.; lead, 17,680,000 lb.; zinc, 9,760,000 lb.; quicksilver, 10,600 flasks. The value of other metals, including chromite, iron ore, manganese ore, molybdenum ore, platinum group metals, and tungsten ore amounted to $2,225,000. The estimated value of clay products was $15,000,000; industrial non-metallic minerals (lime, gypsum, pumice, silica, etc.), $20,600,000, and that of salines, $29,000,000.

★Central Eureka Mining Co. early in February levied a further 25c. per share assessment against stockholders of record Feb. 18. C. C. Prior, president, explained that unforeseen difficulties had prevented the mine at Sutter Creek in Amador County, reopened in October, from paying current expenses so far.

Production, scheduled for 150 tons per day, had reached only 126 tons a day by mid-January. Preparation for extraction of high-grade ore found on the 37th and 38th levels had been slowed by limited hoisting facilities; the 36th level, given preference in development, produced little ore, and the cyanide plant had to be closed down for repairs.

By the first of March, however, the mine had increased milling to 150 tons per day. Mining is proceeding at the 37th level where ore has proved to be even more extensive and richer than indicated by diamond drilling.

★The Argonaut and Plymouth mines have been purchased by B. Monte Verda, owner of Mines Engineering & Equipment Co., from the Argonaut Gold Mining Co. He plans to install new machinery and operate both at substantial capacity when the gold mining situation improves.

★California gold miners are watching with strong interest the progress in Congress of a bill to pay reparations to operators of mines closed by government order during the war. Damages in California, producer of nearly half the nation's gold before the war, amount to an estimated $8 million, Attorney Robert Searls of San Francisco, representing the American Mining Congress, said.

Damages under the bill would cover maintenance costs during the shutdown and the cost of restoration, not production loss during the idle period.

★Ed Carlson and Sam Wilson of Crescent City have discovered a large body of chromite north of the Webb mine in the Crescent City area, according to the Raw Materials Survey, Inc. The ore, assaying 51% chromic oxide with a high chrome-iron ratio, is being shipped to the Chromium Mining & Smelting plant at Spokane.

★The Blue Eyes Mining Co. reported plans for installation of a diesel generator, compressor, washing-trommel and mucking-machine at its Caples property near Michigan Bluff. A new deposit there uncovered just before the war is said to contain gravel 4 ft. thick, with a decomposed schist formation for bedrock.

★Stanford University has announced plans for a $30,000 addition to its mining and metallurgy laboratories, to be completed early in the summer. O. Cutler Shepard, professor of metallurgy, said the new laboratory will be used first for a research contract to study properties of various metal alloys for General Electric Co. and the Navy.

NEVADA

Eureka Corporation seeks power from Boulder Dam—Getchell cyanide mill capacity at 1,500 tons

★The Henrietta mine near Lovelock, held by East Humbolt Mines Co., recently has produced small shipments of Pb-Ag-Au concentrates and sent them to the A.S. & R. smelter at Salt Lake City, according to Paul Bundy, mining engineer. The property and vein has been developed by three drift tunnels, a winze, and a crosscut through the vein zone below the other workings. The vein, two to four feet wide, occurs as principally fill and replacement in and along a fault-shear in meta-andesite.

★Eureka Corporation, Ltd., whose Fad shaft project at Eureka was halted last summer by a flood of muddy water opened on the 2,250-ft. level, will endeavor to secure electric power from Boulder Dam, some 250 miles away. George W. Mitchell, manager, appeared before the Colorado River Commission recently and stated that his company could use an estimated 6,000 kw. at present and could double that figure if power could be obtained from a source other than the diesel electric plant now operating.

The findings of an independent body of engineers looking into the re-flooding of the Fad shaft had not been released early in March. Pumping on a reduced scale has continued.

★Getchell Mine, Inc. plans to resume operations of its cyanide mill in the Potosi district, Humboldt County, enlarged in capacity from 1,000 to 1,500 tons per day. Delays have resulted from the worst winter in many years.

Metallurgy, following two years of experiment with a 100 to 200-ton pilot plant, will differ widely from earlier practice. Ore roasting, formerly in two oil-fired 260 x 7½-ft. rotary furnaces, is to be eliminated. Primary flotation will remove the refractory arsenical pyrite, of which there is less in the deep-level product than near the surface.

All mining is now underground, nearly all through the new shaft. Three thousand feet north of the open-cut, this shaft is designed to cut the orebody on its east dip at around 1,200 ft. Roy A. Hardy of Reno is directing engineer.

★Nevada Uranium Production Co. has provided a Worthington compressor and other equipment at its leased Rainbow mine at Round Mountain, according to W. J. Loring, president and manager. Operators are completing a powder magazine and will extend the main 340-ft. tunnel, largely in uranium-bearing ore, and sink winzes where the highest measure of radioactivity is indicated.

★In the Rosebud district of Pershing County, Constant Minerals Separation Process, Inc., Maurice Constant, Reno, president and manager, is providing equipment to work gold-bearing gravel on a large scale. Screening and washing units have been constructed at Reno but snow delayed their removal to the property, over several mountain ranges. Placers at Willow Creek in Pershing County also have been equipped with a dragline and washing plant of substantial capacity.

★Tonopah men have secured a lease and are reopening the formerly productive property of the Tonopah Divide Mining Co. in the Divide district. Charles Joseph, John Klaus and Louis Cirac are reconditioning the main shaft and report much ore of shipping grade between the 300 and 1,000-ft. levels. Mine equipment, including the electric hoist, was reported in good condition. Operators hope to market their product at the new 100-ton mill of Newmont Mining Corp. at Goldfield, when the plant is prepared to receive custom ore.

★Round Mountain Gold Dredging Co., with large placer and lode properties at Round Mountain, Nye County, has been drilling wells to provide a water supply. Its officers have stated that since the character of bedrock precluded dredging the placer area, gravel will be handled by power shovel and delivered to central washing

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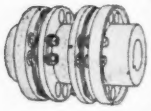

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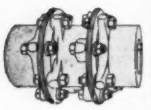

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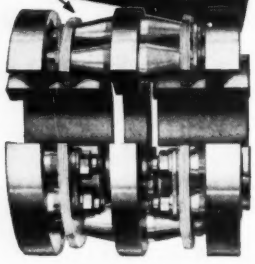

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Nevada *(Continued)*

plants by conveyor belts. The placer area is estimated to contain 45,000,000 cu. yd. of 30 to 40-c. gravel.

★Copper Canyon Mining Co. has been building mill tonnage, largely from its Hornfels lead-zinc-silver orebody opened on the new 700-ft. level of the main Julie shaft. Operators expected to attain capacity millfeed of 350 tons per day during the spring, it was indicated by Robert H. Raring, managing engineer. Diamond drilling has been in progress on the 700-ft. level to ascertain the lateral extent of the lead-zinc orebody, ore from which has produced a concentrate of substantially higher value than did the copper-gold product of upper levels.

WASHINGTON

Mines Management Corp. drilling at Hubbard mine—U. S. Bureau of Mines reports on non-metallics

★Frank J. Luedke, president of Metaline & Pine Creek Cons. Mining Co., reported in February that Sullivan Mining Co., owned jointly by the Bunker Hill and Hecla companies, had spent over $86,000 since July, 1947, diamond drilling 21,364 ft. on the company's Metaline holdings and that results had been "very satisfactory." The contract with the Sullivan company calls for an expenditure of about $90,000 more by March 8, 1950.

Of the 1,751,000 shares at 10c. per share which the Sullivan company agreed to purchase as work was done, 886,710 shares of the Metaline stock have been issued according to H. S. Johnston, sec'y-treas.

★The Holden mill, at Howe Sound Co.'s Chelan copper mine in the Cascades, is handling 2,100 tons of ore per day. According to the company's annual report all copper concentrates and gold precipitates were sold as produced. A portion of the zinc concentrate production remained unsold at the year end because of insufficient plant capacity of the purchaser. The company expects this material and all the 1949 production to be moved under satisfactory arrangements during the current year.

★Of the 3,220 valid votes cast in February by the workers of the atomic energy project at Hansford, there were two to one in favor of the Atomic Metal Trades Council (AFL) as bargaining agent. Provisions by General Electric for voting on job time, free transportation, and 17 polling places accounted for the high percentage of workers voting.

According to announcements from officials of General Electric and AEC, the current reduction in personnel will not alter the production schedules and long range construction for the plutonium manufacturing plant. The layoffs were reported to be natural results of the completion of certain phases of the program.

★Mines Management Corp., which purchased the Hubbard mine 10 miles west of Northport, will begin drilling operations this spring. New equipment is being installed at the company's Iroquois mine at Leadpoint, where work has been in progress all winter under management of Randolph Green.

★A newly published biennial report of the State Division of Mines and Geology states that 95 operations through 13 counties are producing metallic minerals. Stevens County leads with 28 of the operations; Okanogan has 17, Ferry 3, Pend Oreille 11, Whatcom 9, Chelan 5, Snohomish 4, Pierce and Yakima 2 each, King, Kittitas, Lincoln and Skagit 1 each.

Gold-silver operations number 30, lead-zinc 25, lead-silver 18, copper 15, iron and molybdenum 2 each, and 1 each of antimony, lead and tungsten. Thirty-nine counties show production of non-metallic minerals, while there are 165 operations in industrial minerals in 24 counties, King having 46, Chelan 14, Lewis, Spokane and Stevens with 9 each. There are 44 producing coal mines, 35 of clay, 19 of pumice and 14 of limestone.

The total value of the State's mineral production to date is approximately $1 billion, the record year for production being 1943 with $37,593,000.

★Officials of the Bureau of Mines reported that several thousand feet of diamond drilling at the Young America silver-lead-zinc mine, near Bossburg, indicated a mineralized limestone zone ranging in thickness from 30 to 150 ft. A 30-ton flotation mill was erected recently at the mine.

The Bureau has also announced that information is now available at its Spokane and Seattle offices on aluminum clay deposits in Cowlitz, King and Pierce Counties.

OREGON

★Limonite ore is being mined at Scapoose by A. A. Muck and associates and shipped to the C. K. Williams Co., San Francisco. According to B. S. McNay, of the Williams company, it is proving the best paint pigment of its type found in the west. Three thousand tons of the ore have been shipped.

★Production of gold in the state in 1948 was only 15,060 oz., valued at $527,110, compared with 18,978 oz., valued at $664,230 in 1947. Nearly all this output came from placer gold produced by dredging. The two principal producers were Baker Dredging Co. in Sumpter Valley and Porter & Co., Clear Creek-Granite Creek area.

★Only the Buffalo mine in Grant County operated consistently, and that on a limited scale. The Oregon King mine in Jefferson County and the Champion mine in Lane County were operated only a small part of the year.

IDAHO

Bunker Hill and Sullivan increasing milling capacity—Wendell phosphate plant is near completion

★According to Norman Smith, engineer and geologist in charge of Sunshine Consolidated and Silver Syndicate operations, both companies now have full crews of men employed in every available place under development. Stoping in the Sunshine Cons. property, starting on the 3,100-ft. level, is producing a mill feed that averages 42 oz. of silver per ton. The company is now driving a 2,300-ft. crosscut from the 2,700-ft. level to provide ventilation and to open the vein on the same horizon that developed Sunshine's largest and richest orebodies.

★The Riverside Copper Co., Dr. T. R. Mason, Kellogg, president, has subleased fluorspar property, which is part of a large group owned by the Coeur d'Alene Extension Mining Co. and under long-term lease to Jay Bettles of Colorado. The ground subleased is the original fluorspar discovery. The Riverside company expected to start development by April 1.

★Annual report of Sunshine Mining Co. for 1948 announced that in addition to seven other productive orebodies, the company opened another in the Big Creek Apex area which adjoins the Silver Syndicate on the west. The Silver Syndicate vein passed over the line into Big Creek Apex ground and the Sunshine company has drifted 199 ft. on the vein, producing 517 tons of development ore which averaged 18.9 oz. silver and 3.1% lead. Sunshine and Big Creek Apex split the profits equally.

★February snowslides interfered considerably with mining operations in the Coeur d'Alene district. Two big slides in the Burke Canyon temporarily closed the Star Sherman lead mines and mills; several slides blocked the outlet highway to the Jack Waite mine and mill in the Murray district, and a slide in the Pine Creek district destroyed a part of the Spokane-Idaho milling plant. In addition to this, freezing weather over a period of two months practically stopped operation at many of the smaller mills in the district by freezing mill feed in the stockpile dumps. Unfavorable weather conditions lasted from Thanksgiving until the last week in February.

★Bunker Hill and Sullivan Mining Co. has recently increased milling capacity, from 1,500 to 1,800 tons with

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Idaho *(Continued)*

plans for eventual expansion to 3,000 tons per day, to take care of additional tonnages from block-caving operations. This work at present involves a block of ground in the old upper workings containing 300,000 tons of low-grade ore which was not profitable to mine under earlier methods and prices. Charles E. Schwab, engineer, says there are over 5 million tons of this ore left above the main Kellogg adit tunnel level.

★The Yellow Pine antimony-gold mine at Stibnite produced 97% of Idaho's gold output in 1948 as a by-product associated with antimony ore. Other Idaho gold production was from the Elk City, Boise Basin and Yankee Fork districts, where 15 dredge operations recovered 22,000 oz. of gold last year.

★Lucky Friday Silver Lead Mining Co. has received net smelter returns of $90,585.43 for four carloads (275.5 tons) of silver-lead concentrates shipped to the East Helena smelter of American Smelting & Refining Co. in February. A previous shipment of three carloads returned $43,000, representing an advance payment of 80% of the real value. The concentrates averaged 183 oz. of silver, 56% lead, 2% copper and 9% zinc per ton.

Several cars of zinc concentrates were shipped to the Sullivan zinc plant at Kellogg.

★Operators of the Hermanda mine, on the middle fork of the Boise River, 20 miles southeast of Atlanta, report that the first load of concentrates was shipped in January. Mine output has averaged 70,000 lb. of antimony per month. A contract has been made with Goldsmith Brothers, Chicago, who agreed to purchase the entire output of the mine for 12 months.

★The phosphate fertilizer plant being erected at Wendell by Gates Brothers, with the financial cooperation of the Idaho Farm Bureau Federation, was nearing completion early in March. The product, treble superphosphate, has been named "Gem State Phosphate," according to Charles T. Gates, president.

Grading was complete for a second spur line and the Union Pacific Railroad was to finish laying the road within a few weeks. First spur line was put in last fall.

MONTANA

★U. S. Gold Corporation, whose properties are situated in Bear Gulch, Madison County, expects to operate its 250-ton mill by next June, according to Elliot R. Henderson, president. The properties are well equipped with mining machinery and the company expects to drive its 2,800-ft. crosscut an additional 750 ft., to bring it under the gold orebodies encountered in the upper levels.

★Saranac Mining Co. has opened its main ore fissure for a length of more than 1,000 ft., according to Glen Hawe, general manager. The property is located in the Philipsburg-Maxville area of Granite County and concentration tests are being conducted on its silver, lead, zinc and copper ores.

★Jay Bettles, lessee of the Coeur d'Alene Extension Mines Co. property, near Superior, Mineral County, reports further shipments of high grade fluorspar, for which he is said to be receiving $42.50 per ton, f.o.b. Seattle.

★U. S. Bureau of Mines is doing some development work on the Benbow chrome property south of Columbus, in Stillwater County, to increase the estimated tonnages by further diamond drilling, carry on experimental mining in order to discover a mining method that would furnish cleaner ore than was obtained during the wartime operations, and to supply the metallurgical division of the Bureau with representative lots of ore for laboratory and pilot plant tests.

SOUTH DAKOTA

★Homestake Mining Co. recently reported 1948 profit at $2,445,868, compared with $2,585,047 in 1947. Tonnage of ore mined and milled was greater this year than last, though still below the capacity of the plants because of a shortage of skilled miners, according to Donald H. McLaughlin, president. The figures were 896,862 tons in 1948, against 849,032 tons in 1947.

Due to a decline in grade of ore mined, output of gold was 32,457 oz. less than last year, or 360,716 oz. Value of bullion produced was $12,658,139, a decrease from last year of $1,138,582. Metallurgical recovery was 96.85%, the highest ever achieved by the company.

WISCONSIN

★Shaft sinking at Calumet & Hecla Consolidated Copper Co.'s lead and zinc property at Shullsburg is down to a depth of 330 ft., where the cutting of a plat has begun. The shaft will be bottomed after a skip pit has been sunk. Water conditions have caused serious delays. The shaft is making 600 to 700 g.p.m. Timber work for the headframe has been erected and the planking of pockets and sheathing of sides are being rushed. Mill construction is on schedule and the Hardinge mills are in place. Foundation for the rolls has been poured. Main skip hoist is in operation.

IRON COUNTRY

Wisconsin-Michigan Power has diesel generator for peak loads—Marquette harbor open for ore boats

★Officers elected for 1949 by the Itasca County (Minnesota) Mine Safety Council are: J. A. Beecroft, Itasca County mine inspector, president; Walter Gunelson, vice president, and William Olson, secretary.

★In Republic Steel Corp.'s own safety contest for 1948, first place was awarded to the company's Lake Superior iron mines. Included are: Stevenson mine, west of Hibbing, Minn.; Susquehanna, in Hibbing; St. Paul at Keewatin, Minn.; Penokee at Ironwood, Mich., and Tobin, Crystal Falls, Mich.

★M. A. Hanna Co.'s new open-pit mine near Nashwauk, the Perry (named for Perry G. Harrison, of Cleveland), has received a 10-cu.yd. Bucyrus-Erie dragline for stripping.

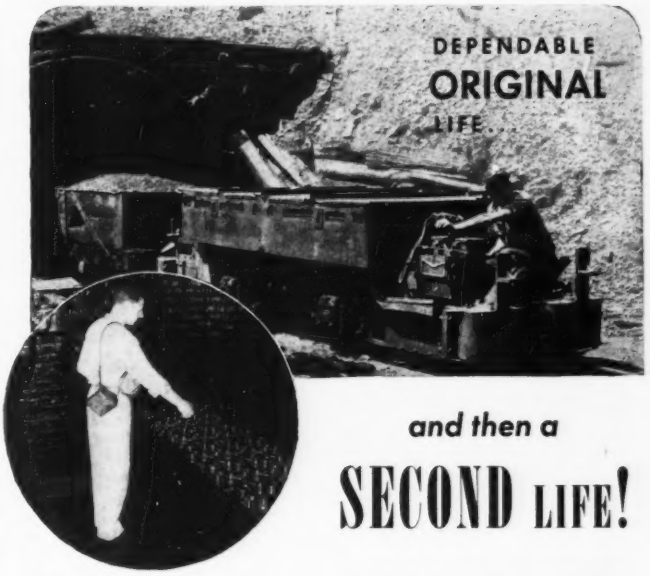
The Hanna company is carrying on a winter program of stripping at the Douglas, Weggum, South Agnew, Mississippi, Perry, Argonne, the Butler Brothers group at Cooley, and the Buckeye mines.

★Pickands, Mather & Co.'s Sunday Lake mine at Wakefield, Mich., will deepen its hoisting shaft to a new level. This will be the 29th.

★Michigan companies are stockpiling their daily production at their underground properties. Mines on all three ranges are busy. Republic's Penokee group at Ironwood, the old Norrie, Aurora and Pabst mines formerly operated by Oliver Iron Mining Co., are no exception though they have been producers for over 60 years.

★Norway, Mich., on the Menominee range has to contend with a unique difficulty. Most areas of the country have been noting with apprehension their gradually lowering water table. Norway, on the contrary, is worried because its water level is rising. Since Oct. 4, when engineers first began to check its elevation, it has come up 3 ft. 9 in. and is still climbing. Steady pumping at Norway's mines for many decades lowered the area's water table. Today all are idle and filled with water. Notes of an old survey made about 100 years ago show that the water level was 4 ft. higher then than now. This survey was made before the mines were operated and it is feared that the water table will reach its original elevation. If so, some of the town's buildings will have water in or dangerously near their basements.

When the Aragon mine was closed the company left a 1,500-gpm. electric pump in the shaft in anticipation of such an emergency. The city council is arranging to start this pump. Inasmuch as the table at the present elevation covers an area of several



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Iron Country *(Continued)*

square miles, there is some doubt as to the result.

★The Wisconsin-Michigan Power Co. has purchased a diesel generator weighing 20 tons which may be moved to any point along its lines to meet an emergency. It is now set up at Iron River, Mich., where it is operated intermittently as needed. It is a 650-hp., eight-cylinder, 400-kw. unit. It is designed for intermittent, not constant, service to help handle peak loads. It can be moved promptly to any station that requires it. It has some advantages over the company's permanently installed diesels in that it is lighter, mobile and self-starting.

★Inland Steel Co. shipped 1,210,029 tons from its four Lake Superior mines (all but the Armour No. 1 being in Michigan) in 1948, including 48,703 tons shipped by rail. This compares with 948,118 tons in 1947.

★On Feb. 9 the Oliver Iron Mining Co. dispatched a train of 125 50-ton cars of iron ore from the Geneva mine at Ironwood, Mich., to the Tennessee Coal & Iron Co. at Birmingham. Both are U. S. Steel Corp. subsidiaries. Other trains will be shipped before the lake navigation season opens. They will be loaded from stockpile and from shaft pockets. This is believed to be the first stockpile-loading of ore for shipment during the winter on the iron ranges.

★Reports of new discoveries of uranium ore appear almost everyday. The Jalore Mining Co. (Jones & Laughlin Steel Corp.) has recorded 19 claims near mile 105 on the Algoma Central railway. Samples were submitted to the Canadian Government which reported that they contain uranium. Further development is necessary to determine whether there is enough ore to warrant opening a mine. Whatever ore is mined will be sold only to the Canadian Government.

★According to the Lake Carriers' Association, the movement of iron ore, limestone, coal and grain on the Great Lakes in 1948 made a new all-time record with 185,359,835 tons. This was 1,200,000 tons above the 1942 peak war year. The tonnage was moved with 33 less vessels than used in 1942, or 326 in 1948 against 359 in 1942.

★The Lake Superior Iron Ore Association reports that there was over 3,000,000 tons more ore at furnaces and Lake Erie ports on Jan. 1 than on that date in 1948. The respective figures are 39,460,497 and 36,094,870 tons. Ore consumption figures show 80,629,057 tons in 1948 vs. 80,806,627 tons in 1947.

★At Mather "B" shaft of Cleveland-Cliffs Iron Co., Negaunee, Mich., the brick engine house has been enclosed and the concrete foundations completed for the man hoist and one large compressor. The man hoist is being erected. The shaft is now down to 2,260 ft. and will be bottomed at 3,000 ft. Sinking speed has slowed down due to the hard, graywacke encountered. Crusher and pan conveyor for the steel shaft house have been received.

★The harbor at Marquette, Mich., was open and waiting for ore boats to start the shipping season in early March. There was no ice in the lower harbor, winds having driven it beyond the breakwater. At Ashland, Wis., the bay was still frozen with 10 in. of solid ice while the ice in the channels at Duluth was close to 22 in. thick, with 27 in. in the slips.

★As announced at their tenth annual mining symposium in January, the University of Minnesota's Schools of Mines and the Center for Continuation Study will offer a special symposium on diamond drilling to be held at the Hotel Duluth, Duluth, Minn., on April 21.

MICHIGAN

C. & H. employment at peak—New company will make buffing and polishing compounds from sands

★Calumet & Hecla employees in the Michigan Copper Country number 2,422, the most in 17 years, including the peak war years of 1942-45. Some of the rise is due to the company's expansion into the fields of scrap metal and copper chemicals, but most of it is attributed to the increase in underground operations of the past seven years.

★The Prozite Company has been organized by Calumet & Hecla and Poor & Co. of Chicago, to make buffing and polishing compounds from conglomerate copper sands.

The necessary equipment will be installed in the Calumet stamp mill at Lake Linden and the products will be manufactured by Calumet & Hecla. Poor & Co. will handle the sales. Officers and directors of the Prozite Company are: chairman of the board, F. A. Poor; president, E. R. Lovell; vice presidents, A. E. Chester, P. W. Moore, A. H. Wohlrab; secretary and treasurer, W. B. Devlin. Directors will comprise the officers, also A. E. Petermann and George L. Craig, of Calumet.

★Two large repair jobs have been finished in Calumet & Hecla's No. 2 Ahmeek shaft after two months' work. Some mining work has been started. A small group of miners is blasting the mass fissure on the fifth level. The copper is going to the smelter.

★Production of mixed copper oxide has been resumed at C. & H.'s Tamarack leaching plant. The plant was down for three months. Supplement-

ing several large orders from industry, others have been received for agricultural applications in Florida. In recent weeks, several cars of oxide have been shipped from the Lake Linden plant to the Tamarack plant to be dried and bagged.

KENTUCKY-ILLINOIS

★The PMT Co., a newly organized mining group which has sub-leased about 40 acres in Pope County from the Hicks Creek Mining Corp., has discovered a vein of fluorspar described as one of the best found in the Kentucky-Illinois district in recent months. Core-drilling revealed the vein to be from 8 to 18 ft. wide according to PMT representatives. PMT has sunk two new shafts, 140-ft. and 125-ft., respectively. Partners in the new operation are C. T. Cochran, M. L. Conn, and Ted Joiner, all of Hardin County.

★Construction of a powerhouse and a hoist-house at the site of the Hutson mine in Livingston County, Ky., has been completed by Alcoa Mining Co., fluorspar division, and sinking of a 510-ft. shaft is scheduled to start immediately. A flotation mill of 100-ton daily capacity will be erected. The Hutson, zinc and fluorspar ore producer, was acquired by Alcoa in the purchase of Eagle Fluorspar Co. properties in Kentucky. A new access road to the mine from Green's Ferry Road, Livingston County route, has been constructed. Company crews will sink the new shaft.

★Alcoa Mining Co. has taken a 120-day option on the Blue and Marble fluorspar property, embracing approximately 50 acres, in Crittenden County, Ky.

★Gil Lokersey, owner and manager of the C & L Fluorspar Mining Co., Elizabethtown, Ill., has abandoned his "strip mine" operations to sink a new slope shaft for fluorspar mining.

★Ralph Cullum, owner and operator of the Cullum Fluorspar Mining Co., is also operating in the Elizabethtown area.

MISSOURI

★St. Joseph Lead Co. last month presented 1,320 service emblems to employees and former employees of the company and its subsidiaries who had completed 25 or more years of service with the company. Nine hundred and fifty of the emblems (representing about one-fourth of St. Joe's employees) went to men now employed, and the remainder to pensioners. Among those receiving the emblems, 162 have 40 years or more of service and nine have 50 years or more.

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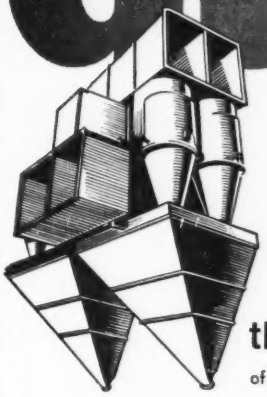

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A PROGRAM TO IMPROVE thickener equipment at Eagle-Picher's Central Mill, Picher, Okla., has been under way for the past nine months. Chief feature is this new 150-ft. diameter, center drive thickener. (Photo courtesy of Dagley Mfg. Co.)

Missouri *(Continued)*

★The Bonne Terre mill, the oldest concentrating mill in the district, has a capacity of about 2,800 tons of ore each 24 hours. It is now operating 24 hours a day on mine ore and chat from the dumps north of the town. Lead content of the chat is about .9% and average lead content of the mine ore is about 2½%, according to *Lead Belt News*. Throughout the lead belt area, approximately 6,000 tons of chat are being remilled everyday.

★Following the 2c. per lb. reduction in the price of lead in early March, St. Joseph Lead Co. and subsidiaries announced that the lead bonus to employees would be reduced 12½c. per shift per 1c. decrease in price. In other words, the lead bonus is to be reduced only 25c. instead of the 50c. per shift that might have been expected. The lead bonus plan states that for each 1c. increase or decrease in the price of lead, there would be an increase or decrease of 25c. per shift.

The company explained that decision to limit the decrease had been made because of the recent improved operating efficiency and because cost of living in the area had not fully reflected lower prices of farm and other commodities. Any reduction made at the 12½c. rate was to be restored at this same rate for each 1c. increase in the price of lead.

TRI-STATE

★Eagle-Picher Mining and Smelting Co. has installed a 150-ft. diameter, center drive thickener of the Butchart spiral type, at the Central Mill at Picher, Okla. The thickener was designed and built by the Dagley Manufacturing Co. of Joplin, Mo. Plans are to re-route the overflow and to recondition the old 100-ft. thickener.

A central pump house, housing 14 five-inch diaphragm pumps, was built in connection with the thickener. Eight pumps are connected to the 150-ft. thickener, six for normal use and two for standby pumps. When an overload comes into the thickener, an extra pump is started by means of a connection with the electric drive of the thickener. There is also an electrically driven raising and lowering device for the spiral sweeps that controls possible overload. The other six pumps are connected to the 100-ft. diameter thickener.

ALASKA

Gold, silver show decline in production, lead is up—Property tax to apply to non-producers

★Preliminary figures from the Juneau office of the Bureau of Mines show that gold production in 1948 declined 19%, and silver 12% under 1947 figures while lead gained 17%. The production of copper and zinc was small with copper gaining slightly over 1947 and zinc decreasing slightly. Total value of the five metals was $8,093,909 against $9,946,568 in 1947.

Preliminary valuation and production figures for the year are given below, with the 1947 figure given in parenthesis directly below the 1948 figure:

	Production	Valuation
Gold	226,323 fine oz.	$7,921,305
	(279,988 fine oz.)	(9,799,580)
Silver	58,497 oz.	52,940
	(66,150 oz.)	(59,866)
Copper	19 short tons	8,322
	(12 short tons)	(5,040)
Lead		108,150
		(76,032)
Zinc	12 tons	3,192
	(25 tons)	(6,050)

★Arctic Tin Co. developed its property on Buck Creek last season, and this summer Clifford Smith and Dave Browne will use an elevated jib washing plant there.

★According to reports from Skagway, Aluminum Company of America is considering the possibility of a plant there.

★F. E. Company has not operated its dredge on Chicken Creek, but it is expected that with better economic conditions, and the completion of a new Fortymile road, it may be started. R. H. Ogburn will be in charge of the company's dredges at Fairbanks, and A. M. Hartford at Nome. Roy B. Earling, vice president, is general manager at both places.

★The following operations have been reported for last season in the Fairbanks area: Awe & Co., small crew on Chicago Creek; Harry Love, small crew on Malamute Pup; Pete Miscovich operating in the Flat district; North American Dredging Co. in the Flat district; Pat Savage drilling on leased ground on Spice Creek and Birch Creek and Turner & Hutton bulldozing on Willow Creek.

In the Willow Creek gold quartz district a few men are engaged in development work at Fern mine, Gold Chord, Higrade, Snowbird and Webb Foot.

★Under the recently enacted 1% property tax the assessed value of unimproved, unpatented mining claims which are not producing, and non-producing patented mining claims upon which the improvements originally required for patent have become useless, is set at $500 for each 20 acres or fraction of each such claim. Mining men point out, however, that the line between an improved and unimproved claim is very narrow and wonder just where that line will be drawn.

The bill also provides for the establishment of "full and true" values on all mining claims, for purposes of taxation, and mining men point out this is a very difficult if not impossible task.

CANADA

Production and cost-aid reports for year—Several B.C. companies investigate iron ore possibilities

★Ontario accounted for 36% of Canada's record mineral output in 1948, with British Columbia second and Quebec a close third. Ontario production was valued at $286,658,000, compared with $249,624,000 in 1947; British Columbia at $147,318,000 compared with $116,773,000; Quebec at $147,082,000 compared with $115,152,000 last year. The total Dominion production came to $806,180,000.

Other provinces, and two territories, all showed increases over 1947 as fol-

lows: Alberta, $92,623,000 ($67,432,000); Nova Scotia, $56,156,000 ($34,256,000); Saskatchewan, $34,421,000 ($32,594,000); Manitoba, $26,768,000 ($18,237,000); New Brunswick, $7,340,000 ($5,813,000); Northwest Territory, $4,289,000 ($2,721,000); Yukon, $3,516,000 ($2,096,000).

ONTARIO

★Employment statistics for Ontario in 1948 show an increase of 1,600 workers in mines, quarries, metallurgical plants, and clay, sand, and gravel pits. Contract diamond drilling in this province decreased 35% last year. The mining industry had 29 fatalities and 2,429 non-fatal accidents in 1948. The number of fatalities was six lower than in 1947 while the total number of accidents reported decreased 7%. This marked improvement was ascribed to the full cooperation between the industry and the technical personnel of the Mines Inspection Branch of the provincial Department of Mines.

★Thayer Lindsley, president of Matachewan Cons. Mines, reported estimated profit in 1948 was $140,985 compared with $225,790 the previous year. Payments under the Emergency Gold Mining Assistance Act amounted to about $58,000. No mine development was attempted last year but plans are being discussed for undertaking work that will carry development to the bottom level at 1,800 ft. G. H. McDougall is mine manager and E. V. Neelands consulting engineer.

★Kirkland Lake Gold Mining Co., located between Macassa and Teck Hughes near the west end of Kirkland Lake's "golden mile," has more ore ahead than ever in the history of the mine, according to Dr. J. B. Tyrrell, president. A 375-ft. ore length in the hanging-wall new branch vein on the 2,350 level has been developed and exploratory work to the west is being continued. Considerable investigation of upper levels for other hanging-wall structures will be made.

Hoisting facilities for the No. 1 winze have been improved by installing a new hoist above the 2,350-ft. level, replacing the old 1-ton skips with 3-ton equipment.

Production is now being secured largely from the deep western ore zone down to 5,450 ft. Narrow but high-grade ore developed from the No. 4 internal shaft has been traced downward by drilling from the 5,850-ft. level, reached from the No. 2 internal shaft. A length of 400 ft. of favorable ground to the Macassa boundary remains to be tested. G. C. Dunn is general superintendent.

★A. A. McCloskey, mine manager at Renabie Mines, located in the Missinaibi area of the Sudbury mining division and controlled by Macassa Mines, reports that major develop-

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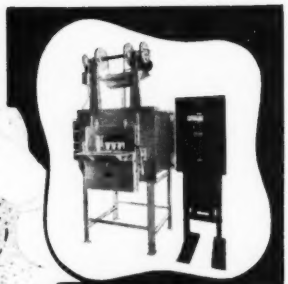

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Ontario *(Continued)*

ment work last year comprised drifting and crosscutting on the upper three levels, and deepening the shaft to 843 ft. Sinking is being continued to 940 ft.

The daily average number of employees last year was 172, with a shortage of trained miners retarding progress. Ore reserves increased slightly to 315,000 tons with an average grade of $8.75 per ton. Production in 1948 was 100,172 tons averaging $8.43 per ton in gold and silver. The president, R. A. Bryce, estimated cost-aid last year at $276,921, leaving a net profit of $64,596. Advances by Macassa were reduced by a repayment last year of $134,129.

★Production last year at Macassa Mines amounted to $1,526,508 including $89,838 cost-aid, as reported by the president, R. A. Bryce. Output was $142,000 higher than in 1947 but the net profit increased only $23,232. Ore reserves showed little change at 450,400 tons on Dec. 31, 1948, after milling 103,650 tons during the year. The mill rate improved slightly to 283 tons daily and will be brought up to the 400-ton capacity as soon as more experienced underground men are available.

The cost of living bonus paid to employees last year exceeded the net amount of government cost-aid by about $10,000. Operating costs per ton have advanced from $7.29 in 1943 to $11.09 in 1948. Current assets were up slightly at $241,622 plus investments, including advances to Renabie Mines, of $1,529,353.

★Aunor Gold Mines, located in Deloro township of the Porcupine camp and controlled by Noranda, last year showed a net profit of $414,038, a reduction of $74,602 from 1947. Government assistance amounted to $100,641. Working capital at $309,745 was lower by $113,710. Current assets stood at $509,810 and liabilities were $200,056. Stanley S. Saxton is mine manager; Dr. W. F. James and Dr. B. S. W. Buffam, consulting geologists.

★Dulama Gold Mines, adjoining east of the Renabie mine, has optioned a 200-ton cyanide mill, pending further metallurgical tests on two sample ore shipments. Development work on two levels has disclosed ore estimated at $1 million and deep drilling has traced the vein system down to 650 ft.

Sampling indicates an uncut average of $13.20 across full drift width along the footwall side of the vein in a section west of the shaft. A vein width of 35.6 ft. was intersected in cross-cutting on the 275-ft. level and a 40-ft. width was intersected at 650 ft. in diamond drilling. The full width of the orebody will be determined by means of a series of flat holes from the second level. M. J. Boylen is president and R. J. Isaacs mine manager.

★New Jason Mines, at Casummit Lake in the Patricia district is moving mill equipment and buildings from the Jackson-Manion mine and plans to have the reassembled mill in operation next July. Rich ore has been opened over a 3-ft. width on the 600-ft. level for a length of 248 ft. Raising is in progress above the 600 and 700 levels, disclosing ore that averages better than 1 oz. gold per ton. C. O. Stee is managing director.

QUEBEC

★Canadian Malartic Gold Mines expects operating profit to be considerably higher this year than last as a result of mill expansion. In January the enlarged mill averaged 1,224 tons daily. E. V. Neelands, president and consulting engineer, states that operating profit for January, including $6,000 cost-aid, will amount to about $18,000.

The average ore grade of $3.66 per ton compares with $3.74 reported for 1947. Unit operating costs have been cut to $2.60 per ton from the $3.24 reported last year. Stope preparation has been completed in advance of requirements. J. P. Millenbach is general manager.

★Since Powell Rouyn Gold Mines resumed milling last October, the daily rate has been held at 315 tons daily, including custom ore from the Donalda and Anglo-Rouyn mines. Tentative payments of government cost-aid for last year amount to $44,496, about four-fifths of the assistance claimed.

In the first nine months of 1948 the Powell shipped 25,179 tons to the Noranda smelter and plans to exceed this rate in 1949. Broken ore in stopes has increased to 52,334 tons. Operating profit last year is estimated at $150,360. J. E. Jerome is mine manager.

★In the Quebec asbestos district the 2,100 employees of the Canadian Johns-Manville Co. at the town of Asbestos went on strike Feb. 14. At Lac Remi, 300 workers of the Nicolet Asbestos Co. failed to report for work Feb. 10 and a week later the strike had spread to all mines at Black Lake, Coleraine, East Broughton and Thetford Mines. The total number of strikers was reported at 4,600, including employees of the Asbestos Corporation, the Johnson Company, and Flintkote Mines.

This action followed a breakdown of negotiations for a new contract that had started in January. Thirteen union demands included better elimination of rock dust, the check-off, approval by the union of all cases of promotion, transfer or discharge, and wage increases for all workers of 15c. an hour, making $1 per hour the base rate.

★Consolidated Duquesne Mining Co., 25 miles north of Noranda in Destor township, is carrying on development and preparation of stopes preliminary to starting production at a daily rate

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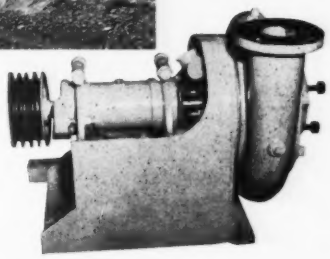

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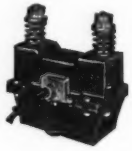

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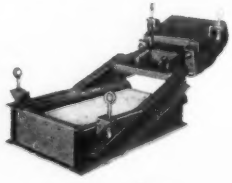

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Quebec *(Continued)*

of 100 tons. A. C. Lee, consulting engineer, states that results of mill tests, to be known by the end of March, will aid selection of the custom mill best suited to the ore. Underground drilling is being used to explore new parallel structures in porphyry north of the shaft. Since last October five stopes on the four levels down to 750 ft. have been opened.

MANITOBA

★Howe Sound Exploration Co. has completed the 2,000-ton mill on the Snow Lake property leased under royalty agreement from Nor-Acme Gold Mines. Production was scheduled to start in March at less than capacity. The process will be standard concentration by flotation and cyanidation of concentrates. Some arsenic in the ore may necessitate roasting concentrates before cyanidation.

A tonnage of 4,860,900 with estimated value of $5.25 per ton has been indicated by extensive diamond drilling on the property, where the Howe Sound company has spent millions on development work and installation of the mill. The shaft has been sunk to 1,000 ft.

★Ogama-Rockland Gold Mines, Ltd., reports production for 1948, exclusive of bonus, totaling $341,656.00 from 27,546 tons, an average of $12.40 per ton. Development of the new Rockland shaft area is now under way with two machines operating on the 125-ft. level and one on the 250-ft. level. Some good grade ore has been encountered in these development headings.

★Callinan Flin-Flon Mines, Ltd., at its annual general meeting disclosed results of last year's diamond drilling and geophysical work. Although structural conditions appeared similar to those on the adjoining property of Hudson Bay Mining & Smelting Co., nothing of interest was intersected in the way of base metal values. Plans for further work will be decided at a later date.

★Hudson Bay Mining & Smelting Co. and Stanmac Limited are negotiating a deal whereby Hudson Bay will finance exploration work on three of the latter's groups of claims near Flin Flon. Stanmac is to continue electrical surveying with the Hudson Bay company following up with diamond drilling. Sherritt Gordon Mines, Ltd., and Berens River Mines, Ltd., are already exploring two of the seven Stanmac groups, and the first drill hole put down on the Sourdough Bay group has intersected 5.9 ft. of ore running 4.36% copper, with low values in zinc, gold and silver. A second hole is being put down now and two more drills are expected to be in operation shortly.

★As a result of a diamond drill hole on the Lode group of claims, located two miles north of the Cuprus mine of Hudson Bay Mining & Smelting Co., important values in copper and zinc are expected. Cores showed 155 ft. of heavy sulphides. The group of claims is owned by Thompson Brothers of Flin Flon.

★Geophysical work being carried out for Nickel Lake Mines, Ltd., by Sherritt Gordon Mines, Ltd., has revealed new possibilities of finding ore beneath Nickel Lake itself. Four anomalies have been outlined, three being non-magnetic. Sherritt Gordon Mines, Ltd., is taking Nickel Lake shares for its work and negotiations are proceeding for it to take options on blocks of treasury stock to finance diamond drilling. Nickel Lake Mines, Ltd., owns 220 claims, located south and west of Barrington Lake.

SASKATCHEWAN

★The Province produced minerals to the value of $30,883,234 in 1947 and to an estimated value of $33,710,000 in 1948. W. James Bichan, Director of Mineral Resources, reports the outlook for the mining industry in 1949 is more favorable than at any time previous, based on active mineral developments already under way or planned. A comparison of mineral production value for the past three years follows:

Minerals	1946 $	1947 $	1948 (est.) $
Metals	19,384,420	23,865,211	25,600,000
Sodium Sulphate	1,082,989	1,793,680	2,225,000
Clay and Clay Prod.	411,446	495,045	500,000
Coal	2,588,624	2,905,789	3,000,000
Petroleum	151,989	614,156	996,000
Natural Gas	24,154	26,346	39,000
Misc.	893,959	1,183,007	1,350,000
TOTAL	24,547,581	30,883,234	33,710,000

★Although production at Hudson Bay Mining and Smelting Co.'s Flin Flon operation was down from its wartime peak, the mine is milling more than 5,000 tons a day.

One of the largest producers of copper and zinc in the Dominion, Hudson Bay also turns out substantial quantities of gold, silver, cadmium, selenium and tellurium. Ore reserves are estimated at better than 20 million tons averaging 2.99% copper and 4.24% zinc. Bulk of the underground work now in progress below the 3,000-ft. level is being done in Saskatchewan. The company has recently commenced construction of a slag-fuming plant on the Saskatchewan side of the border at an estimated cost of $5 to $6 million to recover zinc from residue stockpiles and to improve zinc recovery from present production operations. The plan is expected to be completed in 1950.

★Exploration for precious metal deposits received increased attention in Saskatchewan during 1948. Gold and platinum values in association with pitchblende lenses in the Goldfields area of Lake Athabaska were revealed

by bulk tests. Renewed production of the precious metals is anticipated from this sector as a byproduct of uranium mining operations.

In the Waddy Lake area four separate gold discoveries of high-grade calibre were made during 1948 and surface development indicated that commercial ore zones would eventually be proven. At Laonil Lake a quartz vein system carrying high gold values was tracked down from float clues. At Sulphide Lake, where diamond drilling had already indicated important concentrations of medium-grade gold ore, detailed prospecting revealed additional gold-bearing zones and parallel fissure veins carrying galena with high silver content.

BRITISH COLUMBIA

★Possibilities of a steel industry for British Columbia, and of increased iron ore production, are indicated in several almost simultaneous announcements. Mines Minister R. C. MacDonald reported in the Legislature that the B. C. Government has been approached with a proposal for an iron and steel plant adequate to supply all the needs of B. C. industry and other available markets. Mr. MacDonald said deposits at Zeballos and Quinsam Lake, V. I., and on nearby Texada Island may total 5 million tons. He suggested an electric furnace of 100 to 150 tons daily would be required to supply the Vancouver market.

Canadian Collieries (Dunsmuir), Ltd. will investigate ore deposits on Iron River on Vancouver Island, with a view to erection of an electric steel furnace at its plant at Union Bay, V. I., if sufficient ore is available.

Consolidated Mining & Smelting Co. announced in Vancouver the company would examine ore tailings at the Sullivan mine, Kimberley, to ascertain possibility of manufacturing pig iron. R. F. Stavert, president, said his company was considering a pilot mill and, if experiments prove profitable, an electric furnace to treat the deposit. The 25-year-old tailings pile represents 80% of the tonnage taken from the Sullivan mine.

Iron deposits of Coast Iron Co., Ltd. at Quinsam Lake are being investigated by a nine-man diamond-drilling crew of the Argonaut Company to determine quantity, quality and accessibility of iron ore, according to D. S. Tait, secretary of Coast Iron.

Quarrying of ore for shipment to Wenatchee has stopped because the road from the mine will not stand up to heavy trucks while frost is coming out of the ground, Mr. Tait said.

★Gwillim Lake Gold Mines is planning early production at Toby Creek near Windermere, where it recently acquired the Hot Punch, Mineral King, Black Diamond, Netty M. and Delphine lead-silver-zinc properties. The company has purchased and shipped to the property, the Brown-

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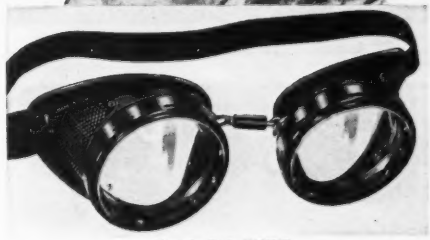

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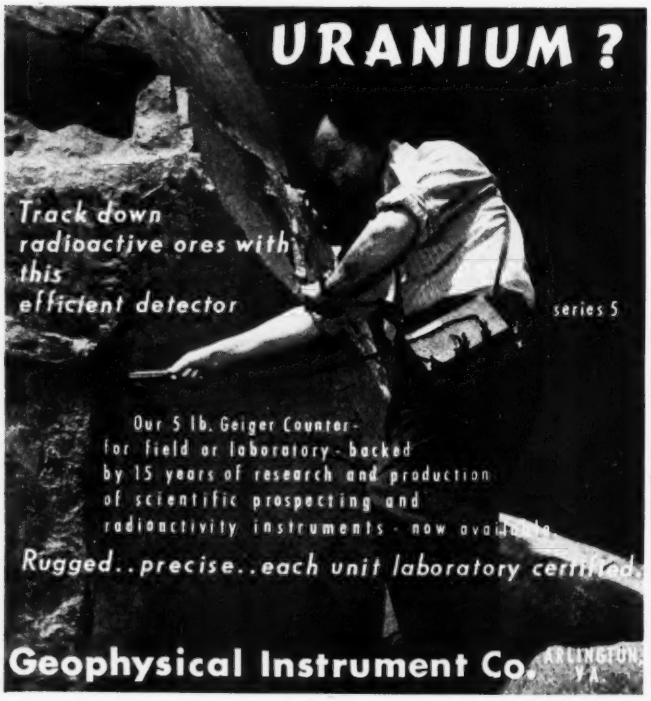
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British Columbia *(Continued)*

McDade mining plant. Ore from the Hot Punch, which was to get first attention, assayed 39.6% lead, 16.2% zinc and 27.2 oz silver.

★Advance in the price of silver at New York is now effective for shippers of custom ore to the Trail Smelter. C. M. & S. announced settlements for the week ending Feb. 19 would be on the basis of the New York price of 71.40 c. per oz.

★Shipments to the Trail smelter for the four-week period ending Feb. 19 totaled 9,910 tons, 2,988 tons more than the four weeks ending Jan. 24, when shipments dropped because of holiday interruptions and bad weather. Lead shipments were 2,004 tons; zinc, 7,906 tons. New Calumet mine, at Campbell's Bay, Que., topped lead shippers with 588 tons; American Metal Company of Calloa, Peru, was the biggest zinc shipper with 5,531 tons.

★For 1948 C. M. & S. Co. announced a total of 54,978 tons of ore and concentrates shipped to the Trail Smelter. American Metal Company of Calloa shipped 13,414 tons to the zinc plant, out of a total of 37,116 dry tons received. Second highest shipper was Lucky Jim Mine, Zincton, with 10,484 dry tons. Top lead shipper for the year was Highland Bell Mine at Beaverdell, with 5,203 dry tons, followed by New Calumet mine, with 2,721 dry tons.

★Dr. W. B. Burnett, president of Cariboo Gold Quartz Mining Co., reports that the mill averaged better than 200 tons daily in January, the first month low levels, down to 2,000 ft., became accessible from the new shaft. During the first half of the year work will be concentrated on opening sufficient known orebodies to permit increasing mill rate to capacity.

Helping to maintain average grade of mill feed is ore extracted from the creshoot, 200 ft. long, opened some time ago in the B. C. vein area on the bottom level. Work will also proceed on opening the main limestone replacement orebody at increased depth. When snow is off the ground exploration of surface deposits on the B. C. vein will resume under the direction of Dr. A. C. Skerl, consulting geologist.

★Van Roi Mines (1947), Ltd. recently trucked ore from a high-grade vein of its silver-lead-zinc mine at Silverton, Nelson district, to the Whitewater mill of Retallack Mines, Ltd. Average for 690 dry tons was $26.60, returning $18,087.

★Yale Lead and Zinc Mines, Ltd., which recently acquired claims at Ainsworth from Ainsmore Consolidated, reports the Highlander tunnel has been driven 40-ft. beyond the vein intersection, switches have been installed for the turn-off and good-grade ore showed in the drift floor.

Opening of the Highlander vein 1,000-ft. below its outcrop is the first step in preparation of the properties for production on a 300-ton milling basis. Next in development will be the continuation of the Mamie tunnel to the Mamie vein and connection of the south workings of the Highlander vein with this tunnel.

To provide accommodation for the enlarging crew and staff the company will purchase the Hot Springs townsite with the hotel and 12 cabins.

★Highland Bell, Ltd., realized net profit of $55,366 in the final quarter of 1948, after depreciation and provision for taxes on income. In the 12 months ended Dec. 31, 1948, Highland Bell shipped 5,466.70 tons of ore containing 740,116.79 oz. of silver, with gross revenue of $611,216, compared to 5,136 tons containing 605,705 oz. silver with gross revenue of $458,367 in 1947.

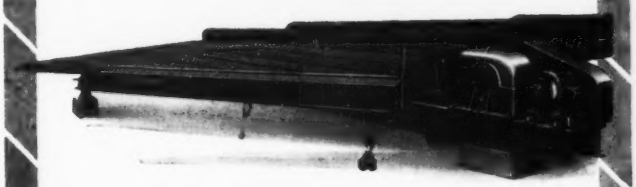
★Vananda Mines (1948), Ltd. reports January output on Texada Island from 1,844 tons milled was $12,254, and from 956 tons of raw ore running 2% or better, was $7,477, a total of $19,731. The mill, which went into production last fall, is currently handling 100 tons daily. Grade of mill feed is gradually improving, stockholders were told at a special meeting. Initial difficulties of the new Vananda operation were ascribed to insufficient development work prior to start of milling.

★The Metallic group of eight claims, between the Galena Farm property and Lucky Thought group near Silverton, has been acquired by Warren Crowe of Wanet and associates from R. J. "Dick" White, former Bralorne Mines foreman. A development program is being carried on under the direction of Mr. Crowe. Shipments of crude silver-lead ore have been made to Trail smelter and a small crew is working on the property.

★Hedley Mascot Mines, Ltd. has taken an option on the Sunloch Mines, Ltd. copper property near Jordan River on southern Vancouver Island, with the eventual plan of forming a $3-million company to develop the property. The agreement gives Hedley Mascot a 90% interest in Sunloch, which is 80% controlled by Consolidated Mining & Smelting Co. and has been inactive since 1943. Under the agreement, Hedley Mascot will spend $25,000 in exploration by Nov. 1, 1949, and an additional $50,000 the year following, and will construct a 300-ton mill and bring the property into commercial production by Nov. 1, 1951.

★Silver Ridge Mining Co., Ltd., Sandon, reports striking high-grade ore up to 8 in. wide together with 18 in. of milling ore in the Wonderful vein. Assays of the high grade give 72% lead and 70 oz. silver per ton. Harry P. Pearson, managing director, said that efforts will be made to put the mine into operation soon if the ore continues to improve.

Operators Who Recognize Trends Choose *SuperDuty*



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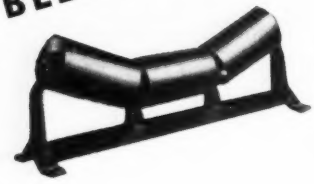

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117A

British Columbia *(Continued)*

★Mountain View group of claims at Rossland has been optioned by Harry F. Kenward and associates. Terms of the option call for payment of $5,000 on June 1 and $50 monthly until $10,000 is paid. The mine is said to be unique in that it possesses both a high-grade precious metal orebody and another base metal ore zone. A sample taken by the optionees across 4 ft. in the No. 4 tunnel assayed 2.28 oz. gold and 1.10 oz. silver per ton. In the No. 4 shaft a width of 18 in. showed 0.80 oz. gold and 0.15 oz. silver per ton, and 0.10% lead and 50.20% zinc. In No. 6 shaft a width of 3 ft. assayed 0.02 oz. gold and 5.9 oz. silver per ton, and 10.2% lead and 44.60% zinc.

YUKON

★United Keno Hill Mines, Ltd., has reported discovery of a vein on Keno Hill which is entirely separate from the workings of the Hector Calumet on Galena Hill. The vein has been established for 400 ft. and is reported to average 11 ft. in width with values from bulk sampling running 10 to 20% lead, 10 to 15% zinc, 50 to 100 oz. in silver, and 0.3 to 0.5 oz. gold to the ton.

An adit 700 ft. on the new vein to give about 200 ft. of backs is to be driven this spring. A new operation may be necessary because of the distance from the Elsa mill. The company expects to add a cyanide unit at the Elsa and have it operating by June. United Keno employed about 200 men through the winter and continued to ship ore concentrates to Mayo, according to H. B. Hicks, general manager. Shipments to the outside this season are expected to be the largest since operations started.

CUBA

★Late in February Mr. Royce Grimm reported to E&MJ that in the last two months he had purchased over $30,000 of new equipment for the Aguas Claras Mining Co. in Cuba, including a jaw crusher, elevator, conveyor, screens, feeders, and a 2-ft. cone crusher. He expected to invest another $60,000 in mine equipment in the immediate future.

A 200-ton mill for processing gold-bearing oxide ore was erected by Aguas Claras last winter after sampling of 50,000 tons of ore gave an over-all value of about $7 per ton.

MEXICO

★An important gold and silver vein is reported to have been found in the Santa Rita mine, Durango. The vein is said to be virgin and 28 ft. wide, of

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undetermined length, the ore assaying 15 grams, one kilogram of gold and 800 grams of silver per ton.

★Mexican mine operators are suffering some inconvenience from the temporary closure of the explosives and blasting fuse plant at Dinamita, Durango, of the Cia. Mexicana de Explosivos, S. A. (Dupont). An unexplained explosion of three tons of nitroglycerine almost demolished the plant; three workmen were killed and 24 others injured. The plant supplies most mining in Mexico with explosives and blasting fuses.

★The National Institute of Investigation of Mineral Resources will be organized by the Ministries of National Economy, Finance, Interior, and Hydraulic Resources, to examine and explore all mineral resources.

★The Cia. Minera Paxtitlan, S. A., Guanajuato, Guanajuato, which ceased operations some time ago, has been ordered by the Federal Board of Conciliation and Arbitration to pay its former employees 491,824.24 pesos ($70,250) to cover wage claims. The employees told the Board the company rejected their proposition that it give them tools and its office building in liquidation of their claims.

CHILE

Mines Bank reports ore purchases for 1948—Government pushes plans for completion of Paipote smelter

★Statistics show that mining has been quite active in Chile in the last few years. In 1947, last year for which complete figures are available, there were 54,000 claims covering an area of 1,880,000 acres. Of this, 75% were for non-metallic minerals, excluding nitrate.

About 95,000 laborers and 10,000 other employees receive their livelihood from mining, which requires 650,000 hp. to move its machinery.

★In 1947 the total value of Chile's mineral production passed the $300 million mark and of this more than $110 million was paid to the State in taxes. Mining provides the country with 80% of its foreign exchange, agriculture with 13% and manufacturing with 7%.

★Caja de Crédito Minero bought a record of 214,750 tons of ore in 1948 as follows:

Class of Ore		M. Tons	Grade
Flotation	Au	18,200	0.53 oz.
Cyanidation	Au	74,600	0.64 oz.
Export	Au	1,400	2.50 oz.
Export	Cu	29,850	12.63%
Flotation	Cu	47,500	2.77%
Export	Pb	6,900	32.57%
Flotation	Pb	11,800	15.60%
Cyanidation	Ag	24,500	9.00 oz.
		214,750	

Could you pass this quiz on WET-TYPE dust collectors?

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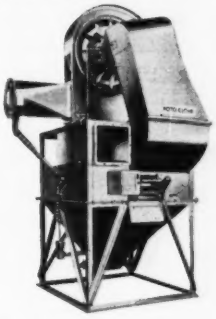

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Question No. 1—What efficiency can be expected from a wet-type dust collector on extremely fine dust?

Answer—Scores of Type W and Type N Roto-Clones are functioning daily at better than 98% efficiency on small micron particles such as found in foundry sand handling systems; ore crushing and screening; material drying, roasting and sintering operations. In fact, it is not uncommon to obtain efficiencies of 99.5% on such applications.

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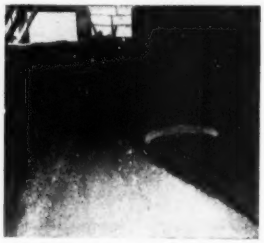

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Chile *(Continued)*

★The tonnage of cyaniding gold and silver ores bought in 1948 has increased so far beyond Caja's milling capacity, because of the high schedule paid for these ores, that the Bank had to refuse to buy gold ores of a lower grade than 16 grams per ton (0.52 oz. per ton). Gold miners protested this rule vigorously, as a large amount of capital was invested in untreated ores at the mills, and the Bank subsequently lowered the requirement to 12 grams per ton (0.39 oz. per ton).

★Laminación de Metales, Sao Paulo, has opened negotiations to buy 5,000 tons of Chilean copper. The Brazilian War Office is said to be interested in buying Chilean copper also, according to the Santiago press.

★Cía Minera Disputada de Las Condes, with large ore reserves and a 500-ton flotation mill, produced 13,669 metric tons of concentrates averaging 31% copper last year.

★The Government will spend about $100,000 this year to repair the harbor construction at Caldera through which machinery imported for the Paipote smelter will be unloaded.

For the first three months of 1949, $780,000 was allotted to the smelter, to be spent on construction work and for machinery and materials.

★The President of the Republic, after consulting the Chile Exploration Co. and the worker's unions, has appointed Judge Franklin Quezada, an expert on labor disputes from the Santiago Court of Appeals, as arbiter on a wage increase asked by the unions.

COLOMBIA

★Pato Cons. Gold Dredging, Ltd., operating on the Nechi River, has reported production in the three months ending Feb. 1, 1949, at 4,609,000 cu. yd. for a recovery of 26,502 oz. fine gold, valued at $927,570.

★Asnazu Gold Dredging, Ltd., operating on the Upper Cauca River, reported production for three months to Feb. 1 of this year at 1,620,600 cu. yd. handled for a recovery of 6,097 oz. fine gold, equivalent to $213,395.

FINLAND

★Mr. H. Stigzelius, Doctor of Technology and department head of the Bureau of Mines of the Ministry for Trade and Industry recently surveyed the Finnish mining outlook before a meeting of the Finnish Engineers' Association. Only four ore mines—Outokumpu, Ylojärvi, Origärvi and

Haveri—are now in operation. Work has ceased at the Mätäsvaara molybdenum mine and the Nivala nickel and copper pyrites deposits. Of the four in operation, Outokumpu is the only one certain to last beyond 10 years. The others are operating at the very margin of profitability, and price reductions may force them to a stop. Sinking gold prices have already brought the Haveri mine into the danger zone.

Only copper and sulphur are recovered and used as industrial raw material in Finland. Zinc, lead and wolfram concentrates are exported, and iron content of the ore is no longer exploited.

Much attention has been focused on the Otanmäki iron ore deposits, but even the scientists cannot reach any agreement as to whether the deposits should be opened up or not. The Government has now granted Fmks 50 million ($370,000) for prospecting in 1949, but no decision regarding exploitation has as yet been made. Limestone is the only non-metallic mineral of importance. However, as limestone products are not exported and balance between supply and demand is likely to be reached in the future, expansion of this industry is unlikely.

AFRICA

President Brand company to mine Welkom No. 3 Lease Area—Six show profit above £1 million

★De Beers Cons. Mines, Ltd., announced that £38,053,843 worth of gem and industrial diamonds was sold by the diamond industry last year. Gem diamonds accounted for £26,741,927 and industrial diamonds for the remainder. In 1947 world diamond sales were £24,500,000.

★Transvaal gold mines milled 4,400,800 tons in January, a slight decrease compared with December's 4,403,400 tons. Working profits totaled £1,939,378, or £1,535 less than December's.

According to the Transvaal Chamber of Mines the average revenue per ton milled for the year 1948 was 34s. 9d., the working costs 26s. 2d., and the declared estimated working profit 8s. 7d. a ton milled. The average working cost per oz. of gold was 130s. 7d. In 1947 working costs were 26s. 7d. a ton milled and 133s. 4d. per oz.

★Five mines showed working losses last year, New Modder with £18,358, Nigel £529, Spaarwater £48,392, Welgedacht £32,342 and Wit Nigel £29,331. Mines with working profits above £1,000,000 included Blyvooruitzicht with £2,663,892, Daggafontein £2,397,296, East Geduld £2,748,327, E.R.P.M. £1,712,331, Grootvlei £2,143,247 and Sub-Nigel £1,619,487.

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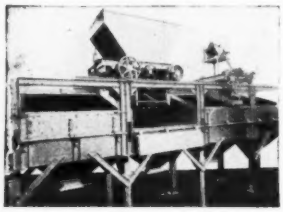

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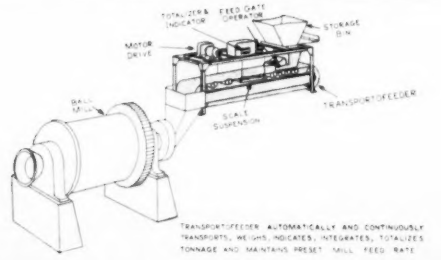
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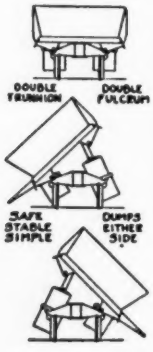

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Africa *(Continued)*

uitzicht gold mine has been showing 100% payability in its development has been broken. In the last quarter of last year the total footage development in the mine was 8,131 ft. of which 4,725 ft. were sampled and 4,565 ft. were payable, about 96%. The value was 56.3 dwt. over a channel width of 11 in.

During the September-December period last year Blyvooruitzicht milled 158,000 tons, yielding 15.508 dwt. a ton. The working profit was £700,155.

★West Driefontein maintained its 100% payability with high values. Of the 110 ft. sampled all was payable, the value being 129.9 dwt. over 10.6 in., equivalent to 1,400 in.-dwt. At the end of the quarter West Driefontein's No. 1 shaft had been sunk to 1,683 ft., No. 2 to 2,756 ft., No. 3 to 98 ft., and No. 4 to 60 ft.

★At Doornfontein mine, the Annan shaft was sunk to more than 1,000 ft. and No. 1 shaft has gone to 380 ft. Erection of permanent headgear at the shaft has been retarded by lack of steel deliveries.

★Western Holdings No. 1 shaft has been sunk to 535 ft. and the temporary wooden headgear has been completed and both sinking hoists have been put into commission. The collar at No. 2 shaft is nearly finished, and shaft sinking is to start soon.

At East Rand Proprietary Mines, Ltd. the collar and temporary hoists at the southeast vertical shaft have been completed.

★In the Orange Free State, shaft sinking at No. 2 shaft Free State Geduld at the end of December was 194 ft. below the collar. Work on the permanent headgear has started.

At Welkom, work has also been started on the permanent headgear for No. 1 shaft which has been sunk more than 490 ft. No. 2 shaft has been sunk to 1,133 ft. Delays were caused by the intersection of many water-bearing fissures, and sinking had to be stopped while fissures were being cemented.

The excavation of the collar of No. 1 shaft, President Steyn mine, was started in November and good progress has been made.

At St. Helena, development work continued in the No. 3 (30-deg.) incline shaft, when 2,879 ft. were accomplished. Of this, 375 ft. was on reef, but no payable values were disclosed. Since the end of the year, a payable stretch has been exposed in the basal reef connection from No. 4 south drive back towards the incline shaft. Of the 140 ft. sampled 90 ft. were payable, averaging 47.4 dwt. over a width of 10 in. (474 in.-dwt.). No. 4 vertical shaft has been sunk to 1,342 ft. from the surface, and 126 ft. of station work has been done.

★Ariston Gold Mines (1929) announced a working profit of £83,115 in the December quarter against £82,769

for the preceding three months. The company stated that exploratory diamond drilling indicates a southwards extension of the new North orebody on the 17th level North Broomassie drive for at least another 300 ft. in payable values. The oreshoot proved on the 20th level in this section for a length of 645 ft. averaged 9.8 dwt. over a not fully exposed width of 92 in.

Extensive development in the upper levels is also planned. This orebody has not been opened up or developed above the 17th level, but is exposed on the surface some 2,350 ft. (on the plane of the reef) above the 17th level.

★O'okiep Copper Co., Ltd. has announced blister copper production for the six months ended Dec. 31, 1948, amounting to 18,475,000 lb., for net profit after depreciation and taxes of $1,463,412. An acid and leaching plant is to be placed in operation this year which will increase capacity for blister copper production by 15%, according to the annual report of Newmont Mining Corp., which company owns controlling interest in O'okiep. A small tungsten plant, started last fall, is expected to be in full operation, on a basis of 125 tons of milling ore per day, by summer.

★The Newmont annual report gives the following figures for Tsumeb Corp., Ltd., South West Africa:

Metals Accounted for by Smelters	Year Ended 6/30/48	6 Mo. Ended 12/31/48
Copper—pounds	10,461,298	7,596,953
Lead—pounds	32,242,043	32,745,458
Zinc—pounds	nil	4,645,960
Cadmium—pounds	59,869	232,861
Silver—ounces	321,796	225,301
TOTAL SALES	$7,604,377	$8,862,732
Net Profit	$1,546,475	$2,765,348

Tsumeb Corp. had expended $5,351,480 for mine and power plant, crushing and selective flotation facilities for milling 1200 tons per day, townsite improvements and general plant rehabilitation as of Dec. 31, 1948. The mine has been unwatered and diamond drilling results below the 1900-ft. level have been so encouraging that a new shaft will be sunk involving expenditure of about $2,120,000.

★The first big new gold mine to start production since the end of the war —the Libanon mine in the Transvaal—began operations on March 1, according to a Reuter's dispatch. The mine, where preparations began nearly 13 years ago, is expected to produce 50,000 tons of milling ore a month, which capacity will be raised in two stages to 100,000 tons a month. The company states that grade of ore milled is not likely to be high.

★While February returns from Rand gold mines in general reflected the effects of the shorter working month, most mill tonnages being below the January levels, Daggafontien in the "Anglo American" group achieved a record output of 165,000 tons. Costs, however, were 4d. higher at 20s. 9d. per ton.

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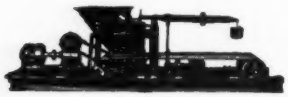

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Africa *(Continued)*

★Anglo-American Corp., Ltd., announces that the President Brand Gold Mining Co., Ltd., has been registered with an authorized capital of £2,000,000 in 5s. shares. It will mine the last of the three leases granted to African and European Investment Co., Ltd., or what is known as Welkom No. 3 Lease Area, south of Odendaalsrust.

Welkom Gold Mining Co. has undertaken to subscribe or find subscribers for four million shares in the President Brand company and, simultaneously with the payment of £250,000 for the mining lease, to take up one million shares at par.

INDIA

★Geologists, after a preliminary survey of Mysore state, reported in February that gold deposits at Bellara in Tumkur district appear most encouraging. Initial work by a private company disclosed two gold-bearing quartz reefs. In 1944 about 3,000 tons of auriferous quartz was mined, from which 613.9 oz. of crude gold was recovered.

The recent survey has showed the extent of reef to be nearly twice the original estimate, and a 10-yr. plan to carry out further exploratory and development work has been approved.

★The Hyderabad Government is sponsoring a company, Hyderabad Gold Mines Co., Ltd., with authorized capital of $3 million, to reopen gold mines in the southern part of the state at Hatti, Raichur district. These mines were abandoned about 30 years ago, after having been operated for many centuries. Engineers interested in the new company now believe some of the richest deposits in the East still lie untapped here. It is reported the company expects to process about 500 tons of ore daily.

★Workers in the four mines of the Kolar Gold Fields in Mysore state have gone on strike for the second time in a year. Demands include an increase in base pay for underground workers to 58c. a day, from the present 35c., and for surface workers to 49c. a day instead of the present 27c. Also sought is an increase in the cost of living allowance to $9.84 a month. The present allowance, which is added to the base pay to compensate for inflationary conditions, is $5.74 a month.

INDONESIA

★Indonesian tin ore exports in 1948 more than doubled those in 1949. Figures are given as 45,543 tons last year as compared with 22,000 tons in 1947.

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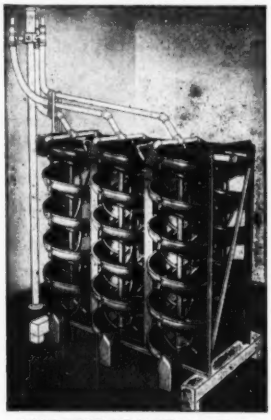

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★The Indonesian islands of Bangka and Billiton, set up as semi-autonomous administrative units (daehras) in 1947, are outside the area at present contested between the Dutch and Indonesian Republicans. Rehabilitation of the important Bangka and Billiton tin workings has therefore not been affected by the Dutch "police" action.

Production of the mines set a new postwar record in 1948 with 31,000 tons (tin equivalent). This is a big increase compared with the 1947 record of 16,200 tons. Highest yearly production ever attained was 43,000 tons in 1940.

Bangka mines now employ about 14,000 workers and 8,000 to 9,000 are working at Billiton. Tin is produced by bucket or suction dredging, and some large high-pressure jet monitors are in use.

In December, 1948, Bangka had 32 tin mines in operation with 10 dredges in full production. Sixteen small concerns are under contract to the Bangka Tin Co. to deliver their ore for processing.

PHILIPPINES

Chromite mines showed good January tonnages—Benguet wage increase may set pattern for district

★Gold production in the Philippine Islands for the year 1948 has been unofficially estimated at 212,874 oz., valued at $7,450,000 at the statutory price. The actual amount received from sales of bullion was much in excess of this figure, presumably 20-30% more, as the open market for gold in Manila during the year varied from $43 to $50 per oz. Some companies are refining their bullion in Manila before offering it for sale. Gold buyers will pay $1.25 to $2.00 per oz. more for refined metal.

Largest producer of the year was Benguet-Balatoc, credited with 80,556 oz. Atok-Big Wedge followed with 65,972, and Mindanao Mother Lode with 32,963.

Gold production in 1948 was only one-fifth as large as in 1940-41, but the value of the production, due to premium prices paid in the open market, was probably 25% of the prewar value.

★Acoje Mining Co. shipped 7,000 tons of chromite, valued at $119,000 in January. The next shipment of 5,000 tons was scheduled for Feb. 20. By March the company expected to be producing 8-10,000 tons per month from underground development as well as additional tonnage from surface workings.

★Misamis Chromite Co. shipped 1,180 tons of 49.1% Cr_2O_3 in January. Work on the road to the second and largest group of claims is going on rapidly.

REDUCE PRODUCTION COSTS *with*

COMPLETE UNDERGROUND AND SURFACE EQUIPMENT BY ONE MANUFACTURER

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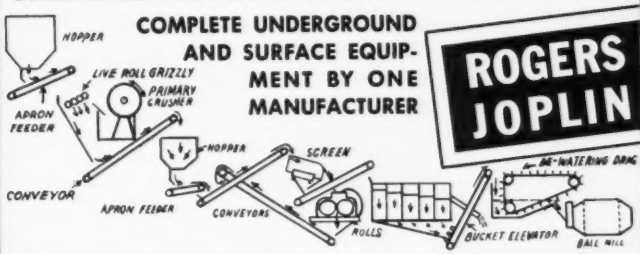

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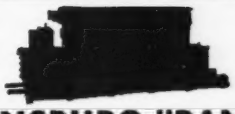

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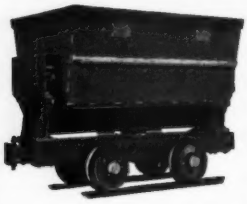

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Philippines *(Continued)*

★Consolidated Mines shipped 23,000 tons of refractory grade chromite during January and anticipates a record of 30,000 tons in February. At the annual stockholders' meeting a complete new board of directors was elected. Benguet Consolidated operates the chromite deposits of the Consolidated company under a profit-sharing contract.

★Production at the Benguet-Balatoc mill in January was $288,000 from 42,943 tons milled, a new postwar record both in ore milled and gross recovery. Mill heads improved with better stope control and more old workings reopened for mining. Additional mill units are being installed. It is anticipated that daily milling capacity will reach 2,000 tons a day within three months.

★In a decision rendered Feb. 13, Judge Roldan of the Court of Industrial Relations ordered Benguet Consolidated to set a minimum wage for miners, 2.70 pesos ($1.35) a day. The prevailing minimum wage for miners prior to the decision was 1.50 pesos (.75) a day. It is likely the rate ordered will set the pattern for the Baguio mining district.

The court at the same time denied the petition of the workers for a closed shop agreement with the Benguet company. It granted 50% additional overtime pay, as well as 50% additional compensation for Sunday work or regular holidays worked.

★Lepanto Consolidated continued to increase output and sent 13,000 tons of ore to the mill, from which 1,757 tons of copper concentrates were recovered.

★Mindanao Mother Lode production in January was slightly improved, with $107,600 recovered from 6,500 tons, averaging $16.55 per ton, compared to $13.87 per ton in December. On the 750 winze excellent ore continues, with a limited amount going to the mill. The first of the special pumps ordered from San Francisco to handle corrosive mine water is due to arrive at the mine in April. When these pumps are installed, work will be resumed on the 850-ft. level.

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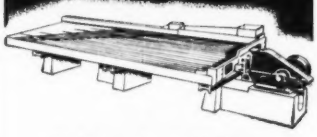
AUSTRALASIA

Mount Morgan's returns show increased copper—Production of New Zealand dredges improving

WESTERN AUSTRALIA

★Mountain View Gold, N. L. shows a net profit of £30,028 for 15 months from incorporation through last November. Ore reserves were estimated at 2,830 tons of main shoot ore (including 250 tons at grass) of 4.47 oz.

MAXIMUM Recovery of Clean Concentrates



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a ton, and 6,900 tons of second grade (including 1,000 tons at grass) of 10 dwt. a ton. The company is operating from the Mountain View shaft, one of three old shafts. It is unsuitable for extensive mining, but it has been decided to defer the sinking of a new shaft until the Great Fingal shaft has been unwatered to 550 ft.

★North Kalgurli (1912), Ltd. treated 217,541 tons for 57,906 oz. in 1948.

★Sons of Gwalia, Ltd., won 18,139 oz. of gold in 1948 from 67,289 tons of ore and 6,333 tons of residue.

★From the Gigi lease at Tuckabianna, 18 miles east of Cue, a miner put 15½ tons through the Cue battery recently for 455½ oz. over the plates. The sands assay is yet to come. On the basis of the battery return, the ore averaged 29½ oz. a ton.

NORTHERN TERRITORY

★High grade peacock (bornite) ore is being broken from a 20-ft. face at the 145-ft. level in the Home of Bullion mine, 200 miles north of Alice Springs, according to the *Industrial & Mining Standard*. The ore is being delivered to the railhead at Alice Springs at the rate of 100 tons a week. Recent 200 tons dispatched to Port Kembla for refining is expected to average 20% Cu.

QUEENSLAND

★In the year ended June 30, 1948, Mount Isa, Ltd., realized a record net profit of £872,921 and distributed a record dividend of 17%. Outputs of silver, lead and zinc were higher, assisted by a larger labor force, although ores of lower grade were worked. Production of copper, a major activity during the war, was not resumed. The copper plant was shut down in May, 1946, and in the same month the mine commenced concentration of lead-zinc ore and resumed smelting of lead concentrates. A new plant is under construction to recover copper as well as silver, lead and zinc. The projected annual capacity of 37,000 tons of lead, 24,000 tons of zinc, 2,775,000 oz. of silver and 18,000 tons of copper should be reached in 1950. Exploratory drill holes suggest extensive continuation of good grade lead-zinc and copper orebodies outside the recognized reserves of 9,600,000 tons.

★Grade of copper in Mount Morgan's recent returns showed a marked increase from 0.5% to 0.7%, and as work in the cupriferous zone continues, the copper assay may average as high as 1.9%. This is doubly interesting to the company since its gold production is closely allied to blister copper volume. To develop new ore reserves, Mount Morgan is embarking on an extensive diamond-drilling project. The mine is also planning to develop its large pyrites dumps for their 50% sulphur content.

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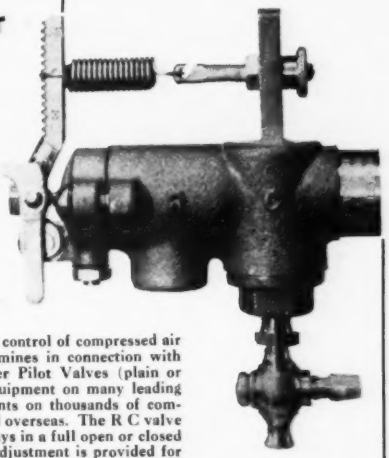

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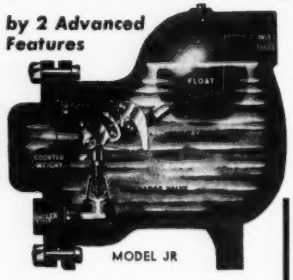

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Australia *(Continued)*

NEW SOUTH WALES

★The Mining Managers' Association at Broken Hill has notified the Barrier Industrial Council that the lead bonus for March, payable to all mine workers, will be £2/12/6 a shift or £13/2/6 (about $43) a week. The bonus is additional to the "award" wage of about $22 a week. Rise in the bonus amounts to about $5 a week.

★The strike at Captain's Flat for payment of a lead bonus on Broken Hill terms has, in its fifth month, entered a new phase with the breaking away of the miners from the moderate Australian Workers' Union and their subsequent affiliation with the militant Miners' Federation. The Federation has assumed responsibility for the financial support of the strikers. An offer by the Lake George Mining Co. to divide 20% of its profits among employees, in addition to paying a lead bonus of $10 a week, has been rejected by the miners.

TASMANIA

★First accounts of King Island Scheelite (1947), Ltd., for the year to Oct. 31, 1948, disclose a net profit of £78,731, after providing £30,000 for depreciation. The company acquired the workings of King Island Scheelite, N. L., in 1947. In the first year of its life as public company the mine returned 592 tons of scheelite concentrates from 142,641 tons of ore, containing 40,335 units of wolfram. This was a lower recovery from more ore, compared with the old company's final returns. Delays in the delivery of two Lorrain shovels from Manila caused a severe setback to overburden removal last year, but both shovels are now in operation, enabling net production to be stepped up to 181 tons of scheelite concentrate in recent three months. Moreover, a better grade of ore is now being milled. Ore reserves at Oct. 31 were estimated at 2,948,383 tons.

VICTORIA

★The state's gold production in 1948 amounted to 68,580 oz., 16,129 oz. less than in 1947. The decrease was accounted for mainly by a reduction in values at the A-I Consolidated Mine, at Gaffney Creek, and by the cessation of operations by the Victoria Gold Dredging Co. at Strangways.

NEW ZEALAND

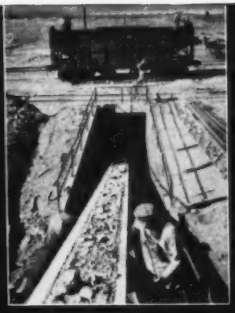
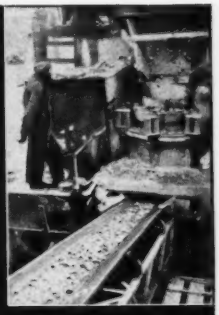
★Some of the Dominion's high capacity gold dredges have been able to maintain production in spite of the blow which the industry received in August, 1948, through the appreciation of the £NZ to parity with sterling. As a result of this currency move, gold producers now receive only 5s. for each $1 worth of gold (1/35 oz.) compared with about 6¼s. under the old exchange rate. Although the government expected that costs would come down nearly in inverse ratio to the currency appreciation, this has not been the case. Remission of the gold export tax, to which the government consented as a sop to producers, covers them for less than one-third of the exchange loss. They have so far been unsuccessful in attempts to obtain aid in the form of subsidies.

Most of the lode mines, which in recent years accounted for about one-third of New Zealand's gold production, as well as the less efficient among the Dominion's sixteen dredges, have been put out of business. Some of the larger dredges, however, are doing remarkably well.

★Kanieri Gold Dredging, Ltd., an Australian-controlled company, is treating a record volume of 250,000 cu. yd. for nearly 700 oz. every month.

★Arahura Gold Dredging, Ltd., operating close to Kanieri, is making good profits by selective dredging in rich ground, and though its yardage has fallen off, net returns have actually increased.

★Bulolo Gold Dredging Co., Ltd., has reported January production by seven dredges handling 881,081 cu. yd. was about 5,057 oz. of fine gold, a substantial improvement over December, when recovery was 4,220 oz. from 594,604 cu. yd.

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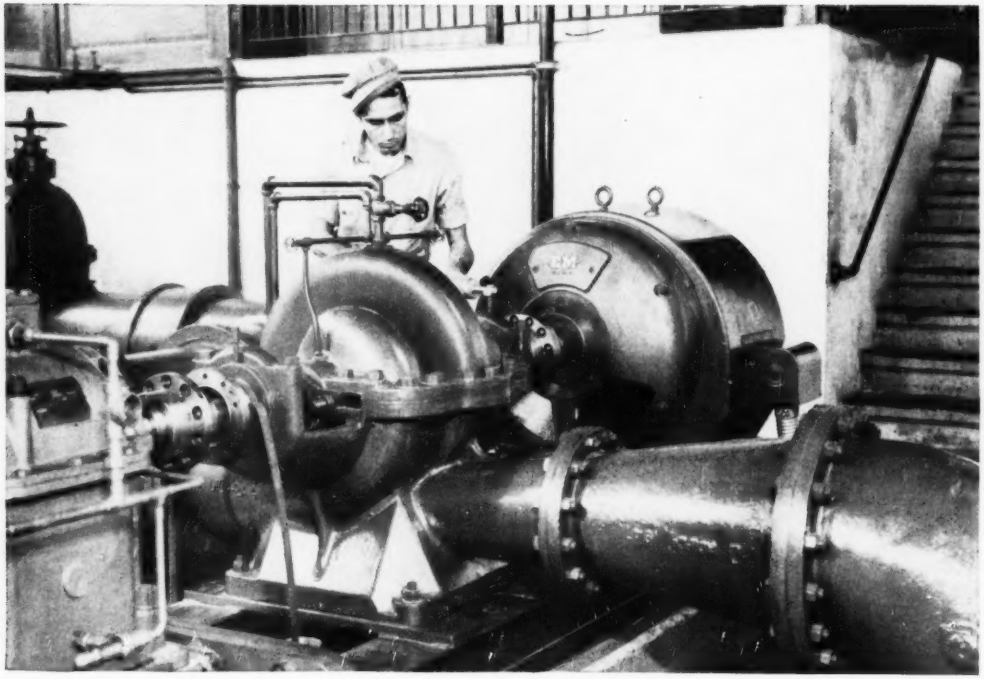
MANUFACTURERS OF QUALITY RUBBER PRODUCTS FOR OVER 75 YEARS



History repeats itself

WITH RESULTS OF GREATEST IMPORTANCE TO USERS OF HEAVY-DUTY INDUCTION MOTORS

●Running with cool, quiet efficiency on some of industry's toughest jobs, E-M Heavy-Duty Squirrel Cage Induction Motors are furnishing on-the-job proof that there are differences in induction motors . . . in their reliability, economy, maintenance.

The development of these motors has been a case of history repeating itself . . . of bringing to the design and construction of induction motors the same kind of specialized large-motor creative engineering that has made Electric Machinery the headquarters for pacemaking developments in synchronous motors for nearly forty years. The long-lasting, quiet-running rotors of E-M Induction Motors, their wear-resistant, anti-friction or modern 1 to 1 ratio sleeve bearings; long-life, multi-layer insulation and job-engineered external protection are things that pay off in dependable and economical operation.

For example, the job-engineered protection of a drip-proof shield on the water pump motor shown above (400 h.p., E-M Induction Motor in Wichita plant of Kansas Water Company) eliminates any danger of damage and breakdown from dripping water or other falling material. Splash-proof and fully enclosed protection may also be obtained.

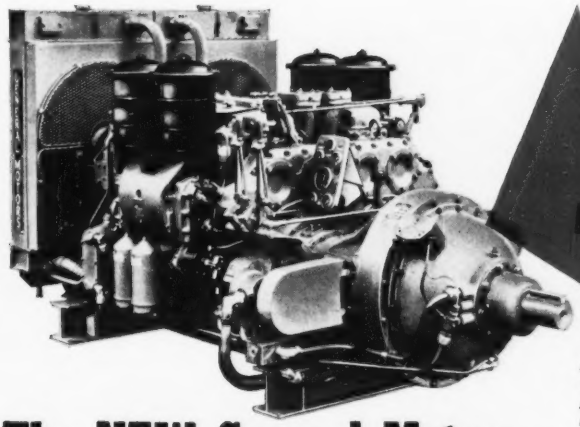
These great induction motors are the answer to the need for electric drives that can be relied on to serve long and well on the toughest, heavy-duty jobs. For full information, write for our publications 189 and 190.

ELECTRIC MACHINERY MFG. COMPANY
Minneapolis 13, Minnesota

1300-TPA-2089

E-M

SPECIALISTS IN
BIG MOTOR ENGINEERING

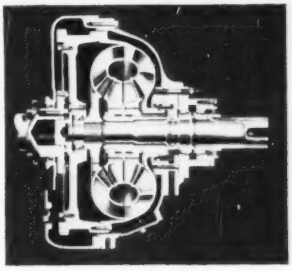


A Combination Torque Converter and Fluid Coupling *Integral with the Engine*

General Motors 71 Diesels equipped with the new GM Torque Converter take up no more space or weight than the same engines with conventional friction clutch and power take-off. Available in 3-, 4-, and 6-cylinder single engine units. Twin 4 and Twin 6 models having engine ratings from 75 to 300 H.P.

The NEW General Motors DIESEL ENGINE-TORQUE CONVERTER UNIT

HERE is a complete, integrated Diesel engine-torque converter unit that combines the inherent efficiency of the GM 2-cycle Diesel engine with the features and advantages of *both* torque converter and fluid coupling. It provides *torque multiplication up to 4 to 1* for starting variable heavy loads. It also provides *highly efficient transmission of power* during light load periods by *automatically shifting to fluid coupling* in the upper speed range.



In the new GM Torque Converter, oil does the work. Automatic transition from torque multiplication of 4:1 at stall to 1:1 in upper speed range.

A smooth, uninterrupted flow of power, delivered through a liquid, *prevents engine stalling* under any load and *protects both engine and driven machinery from sudden shocks.*

One Manufacturer—One Responsibility

Up to now most engines and hydraulic drives have been separate units. The result—compromise designs and divided responsibility. Now General Motors offers a new torque converter specifically designed and manufactured as an integral part of the General Motors Series 71 Diesel engine. It is a self-contained unit built by one manufacturer providing a long needed saving in space and weight as well as certain desirable operating characteristics not available before.

This new power unit will get the most work done in the least time because the engine operates in its most efficient speed range at all times—delivering maximum engine horsepower regardless of the speed of the load. *Maximum torque to start heavy loads PLUS maximum horsepower to keep the load moving.*

Everyone with a hard job to do in the oil fields, in construction, in mining or in logging should have all the facts about this compact, flexible GM Diesel Engine Torque Converter unit. *Write today for a complete description.*

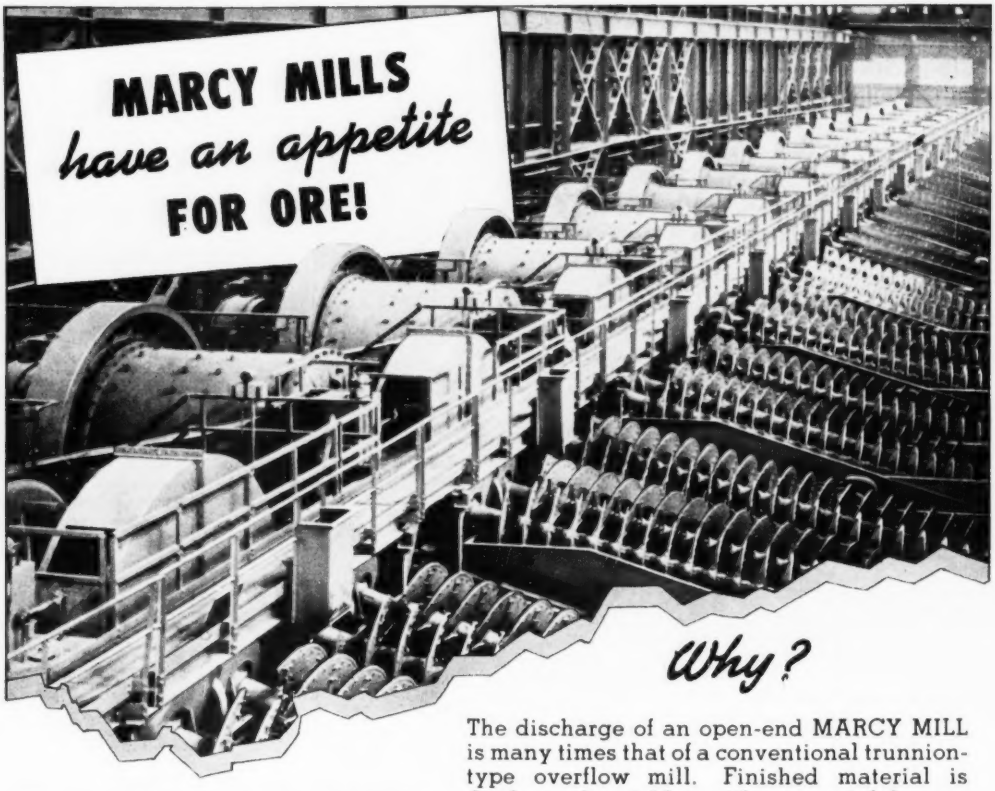
DETROIT DIESEL ENGINE DIVISION

SINGLE ENGINES . Up to 200 H.P. **DETROIT 28, MICHIGAN** MULTIPLE UNITS . . Up to 800 H.P.

GENERAL MOTORS

DIESEL BRAWN WITHOUT THE BULK

GM GENERAL MOTORS **DIESEL POWER**



The capacity per shift of all MARCY MILLS now in operation constitutes a staggering tonnage. In all ore dressing: iron, copper, lead, molybdenum, gold, nickel, zinc, silver, and all the rest, a high proportion is ground in MARCY MILLS. With the necessity of working lower grade ores, only lower milling costs can maintain operations at a profit. Far-seeing plant mining men have taken this into account in their grinding sections by installation of MARCY MILLS.

The discharge of an open-end MARCY MILL is many times that of a conventional trunnion-type overflow mill. Finished material is discharged quickly, without wasteful over-grinding. Ball cushioning is less in a MARCY BALL MILL; impact and effective grinding much improved. The advantages are increased tonnage, lower per-ton cost and vastly improved metallurgy in any following flowsheet.

Operating costs are lower because of lower power requirements in MARCY MILLS. Their tough, long-lifed liners and grates are easily replaced, and grates have an exceptionally long life. For lower costs in your grinding sections, consider the advantages of MARCY MILLS. Permit our engineers to consult on any grinding problem.

Main office: Denver, Colorado, U.S.A.
El Paso, Salt Lake City, 1775 Broadway, N. Y.
Canadian Vickers, Ltd., Montreal
W. R. Judson, Santiago and Lima
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Massco Fahrenwald Flotation Machines; Genuine Wilfley Tables; Massco-McCarthy Hot Millers; Rock Bit Grinders; Density Controllers; Belt Feeders; Pinch Valves; Assay and Laboratory Supplies and Equipment; Complete Milling Plants; Constam Ski Lifts.

The Mine & Smelter Supply Co.

YOU JUST CAN'T BEAT EUCLIDS

for

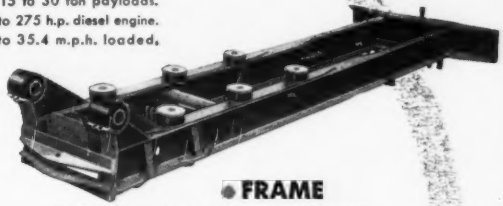
BIG LOADS

and

TOUGH HAULS

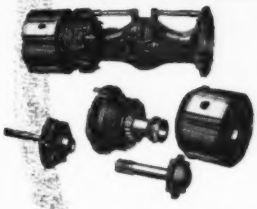
Euclids have earned their reputation for efficient, dependable service on the toughest hauls in mine and quarry service. Their rugged strength and stamina has made "EUCS" the standard hauling equipment of many leading operators. Here are some of the reasons why:—

REAR-DUMP EUCLIDS
CAPACITIES—15 to 30 ton payloads.
POWER—150 to 275 h.p. diesel engine.
SPEEDS—Up to 35.4 m.p.h. loaded.



• FRAME

The Euclid frame is a welded structure of tremendous strength. Large rubber body support pads cushion the impacts of loading under large shovels and hauling capacity loads over rough roads. There is no metal to metal contact between body and frame.



• DRIVE AXLE

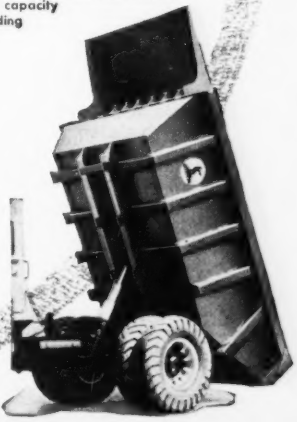
The planetary type drive axle of Euclid design and manufacture has been used on all Euclid hauling equipment for over fifteen years. It is unequalled for long life and continuous performance in off-the-highway service.

• BODY

Rear-Dump Euclid bodies are designed for hauling rock and heavy excavation. Smooth interior and flared rear chute provide unrestricted flow of material. Sturdy box sections reinforce the heavy body at sides and bottom.

• HOIST

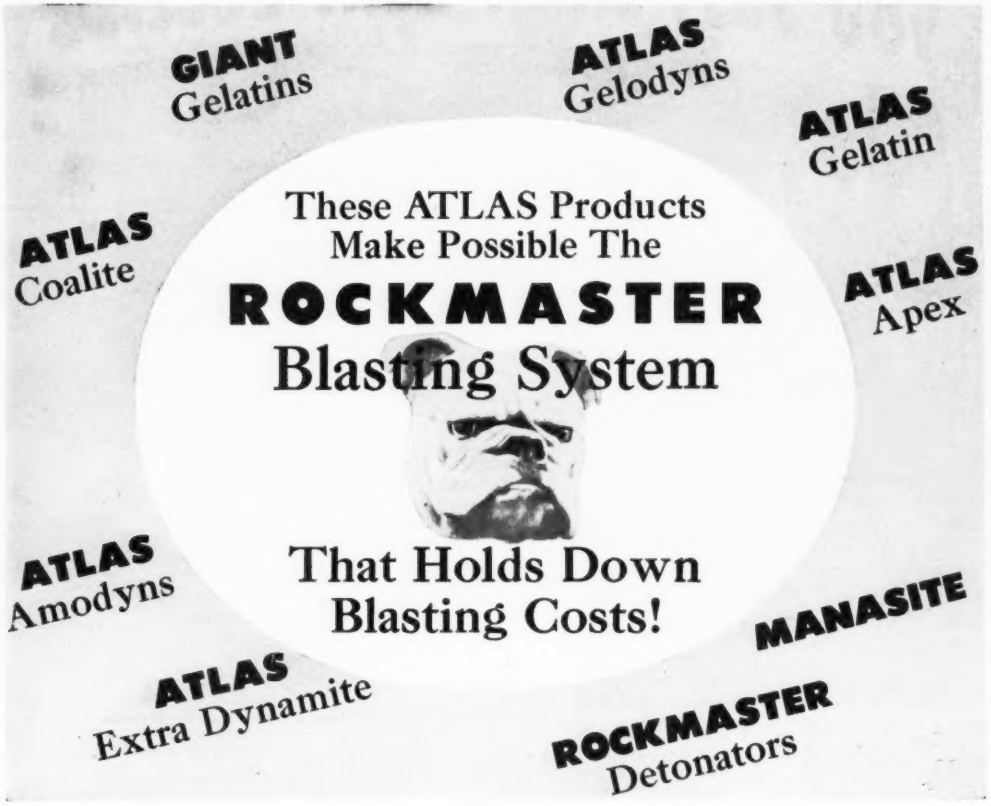
The double-acting Euclid hydraulic hoist provides positive control of body at all times. High dumping angle and ample hoist capacity assure fast, clean shedding of the load.



The services of a hauling equipment specialist are available upon request and without obligation . . . write or call your Euclid Distributor.

The EUCLID ROAD MACHINERY Co., Cleveland 17, Ohio

EUCLIDS *Move the Earth*



Equipment, explosives, blasting supplies, labor and drilling costs are up these days! But on many a blasting job, over-all costs are being held down by ROCKMASTER—the original milli-second delay blasting system pioneered by Atlas. ROCKMASTER, geared with the right explosive, makes possible outstanding savings through improvements in fragmentation and control of throw . . . and greatly decreased noise and vibration. This adds up to lower *over-all* costs!

ROCKMASTER is designed to "fit like a glove" these other Atlas developments that have made Atlas a leader in the field of explosives. Your Atlas representatives will be glad to show *you* how to make the most of ROCKMASTER advantages.

See us
Booth 400
Coal Exposition

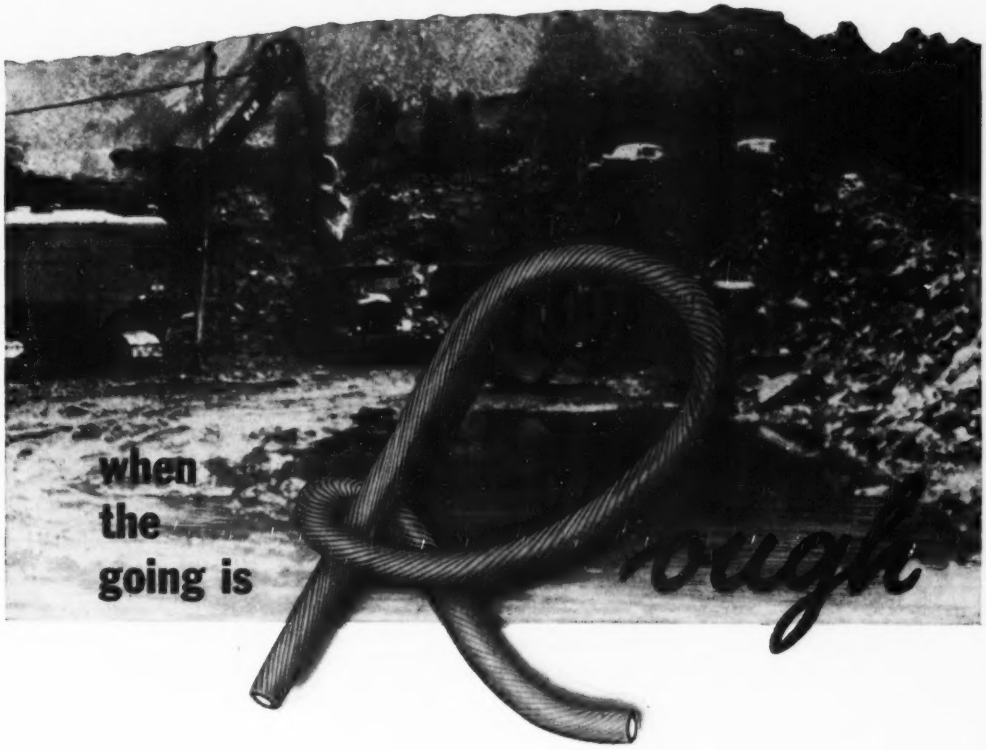
Rockmaster, Manasite, Gelodyn, Amodyn, Apex, Coalite—Reg. U. S. Pat. Off.

ATLAS EXPLOSIVES
"Everything for Blasting"

CHEMICALS ATLAS EXPLOSIVES

ATLAS POWDER COMPANY, Wilmington 99, Del. • *Offices in principal cities* • *Cable Address—Atpowco*

PRIMACORD makes it easy . . .



You can depend on Primacord to give you sure-fire results when the going gets rough. Branch lines down each hole initiate instantly the entire charge from top to bottom. Problems of deck loading are simplified by the use of Primacord. When you shoot, each charge *goes* with peak explosive power. You get thorough fragmentation—the kind that keeps big equipment on the move.

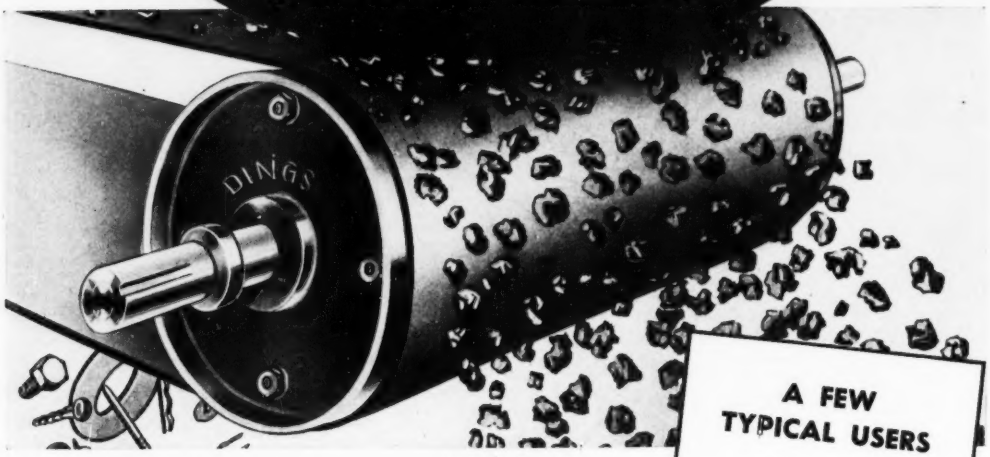
Primacord is flexible, easy to handle . . . it hooks up quickly with simple square knots or half-hitches. It's wound on spools that are a cinch to carry and unreel as loading operations move along. Insensitive to stray currents, it's the logical detonator to use around high-voltage electrical equipment.

There's a grade of Primacord to meet every blasting condition. Ask your explosives supplier; or write us direct. The Ensign-Bickford Co., Simsbury, Connecticut. P-21

PRIMACORD-BICKFORD Detonating • Fuse •

THE MODERN WAY

To Protect Vital Machinery from Tramp Iron Damage



NEW! Dings ALNICO MAGNET PERMA · PULLEY*

AND PULLEY TYPE SEPARATORS

No wiring . . . no electrical accessories . . . no operating cost . . . no maintenance . . . good for life . . . tremendous power . . . completely automatic — The new Dings PERMA-PULLEY is a revolutionary contribution to magnetic separation. You can install it and forget it!

Backed by 50 years of magnetic separator manufacturing experience, this new pulley offers these plus features that assure you of maximum tramp iron removal:

- **Extra high strength grade of Alnico**
- **Closely spaced poles**
- **Magnetic strength equal across entire belt width**
- **Crowned face to prevent belt weave**
- **Extremely high surface strength**

Dings PERMA-PULLEYS are available in 53 sizes with shaft diameters to suit your requirements. ALSO complete pulley type separators with PERMA-PULLEY, idler pulley, belt and drive in any size required. SEND for new CATALOG C-1007A.

DINGS MAGNETIC SEPARATOR COMPANY
4716 W. McGeogh Avenue • Milwaukee 14, Wisconsin

A FEW TYPICAL USERS

HUMPHREYS GOLD CORP.
Jacksonville, Florida

COMPAGNE ARAMAYO DE MINES
Bolivia

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STARR COALS, INC.
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BLACK HILLS TIN CO.
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Dings "HIGH INTENSITY"

MAGNETIC PERMANENCE GUARANTEED *for life!*

ALUMINUM IS LIGHT

ALUMINUM IS STRONG

Are these facts Cutting Your Costs—or Someone Else's?

The day has come when your jacks and other mining equipment will be measured against a new kind — made of Alcoa Aluminum. They will be strong, light, lasting, and easy to handle.

When you use equipment made of Alcoa Aluminum, you know that it is backed by sixty years' knowledge of alloys, of fabricating methods, of thousands of test results.

If you have an idea for new equipment in aluminum, Alcoa stands ready to help you with sixty years of experience. Write for "Alcoa Aluminum and Its Alloys", or call the Alcoa sales office nearest you. ALUMINUM COMPANY OF AMERICA, 650 Gulf Building, Pittsburgh 19, Pennsylvania.

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ALCOA ALUMINUM

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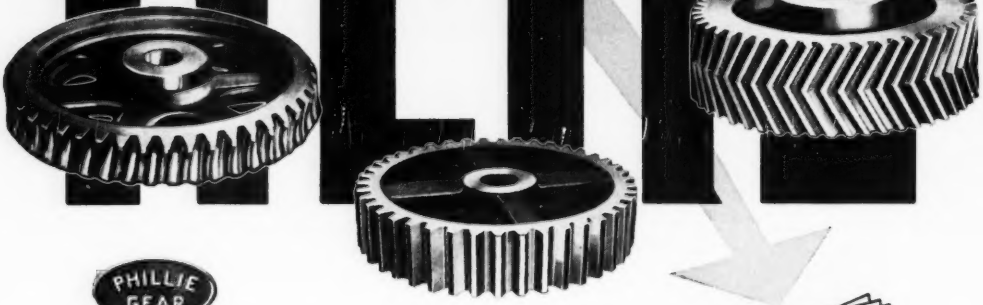
Engineered GEARS . . . all TYPES, SIZES, MATERIALS and QUANTITIES HERE



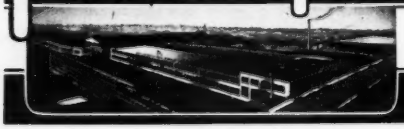
PHILLIE GEAR

Worms and Worm Gears, Spurs, Herringbones, Internals, Intermittents, Helicals, Spiral-Bevels, "Zerols", "Hypoids", Non-Metallics, Racks, etc.

Engineered gears in every sense of the word,—carefully designed, cut, machined and tested in one of America's largest and most modernly equipped gear plants. . . . A plant which has been producing gears for more than 57 years.

Send for our latest 68 page "Gear Book", and please use your Business Letterhead when writing for it.

Philadelphia Gear Works, INC.

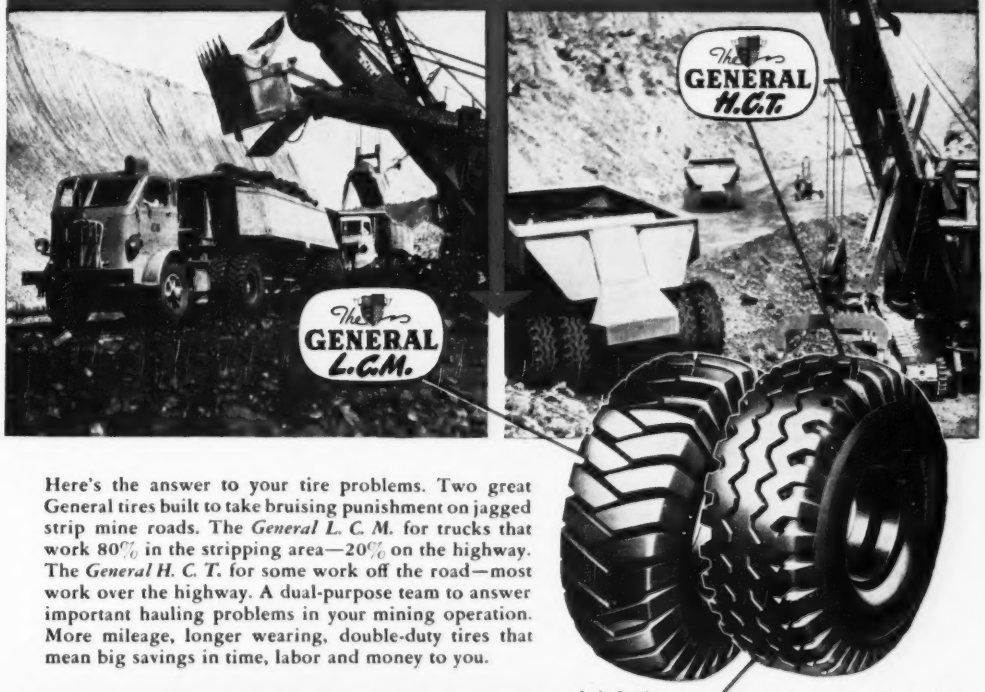


ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO
IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

OVER SHARP ROCKS, DEEP RUTS, MUD, SLUSH AND GRAVEL, *Generals* MOVE HEAVY LOADS OUT AND OVER THE HIGHWAY

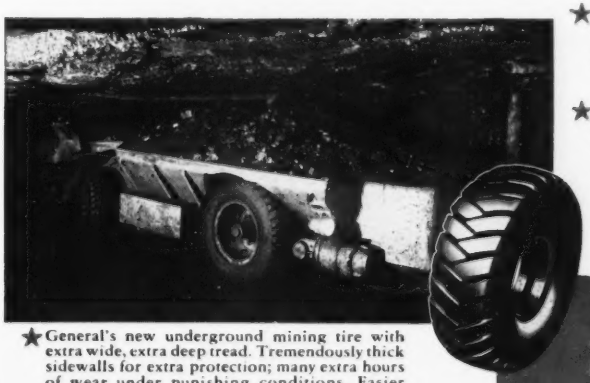
Faster, Cheaper, Safer



Here's the answer to your tire problems. Two great General tires built to take bruising punishment on jagged strip mine roads. The *General L. C. M.* for trucks that work 80% in the stripping area—20% on the highway. The *General H. C. T.* for some work off the road—most work over the highway. A dual-purpose team to answer important hauling problems in your mining operation. More mileage, longer wearing, double-duty tires that mean big savings in time, labor and money to you.

★ L.C.M.—Extremely thick, tough tread cushions tire surface against snags and cuts. Tremendous self-cleaning shoulders throw off mud and rocks, while deep cleats develop powerful traction.

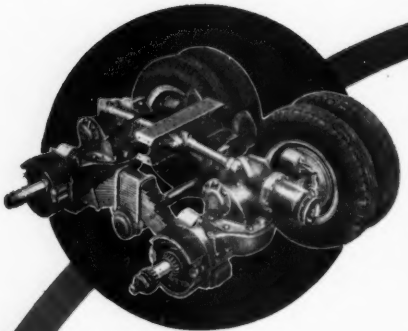
★ H.C.T.—Double-thick, tough tread. Greater blowout protection. Extra deep tread grooves develop extra traction through mud, slush and gravel . . . prevent slipping and spinning.



★ General's new underground mining tire with extra wide, extra deep tread. Tremendously thick sidewalls for extra protection; many extra hours of wear under punishing conditions. Easier steering, more traction.

The GENERAL TRUCK TIRE

THE GENERAL TIRE & RUBBER CO., AKRON, OHIO



ONLY MACK offers this matchless Balanced Bogie with exclusive Power Divider. Unusual flexibility and balance insure even tire loading and uniform braking; cancel out weight transfer. Mack Power Divider assures good going by transferring power to wheels maintaining the best traction.

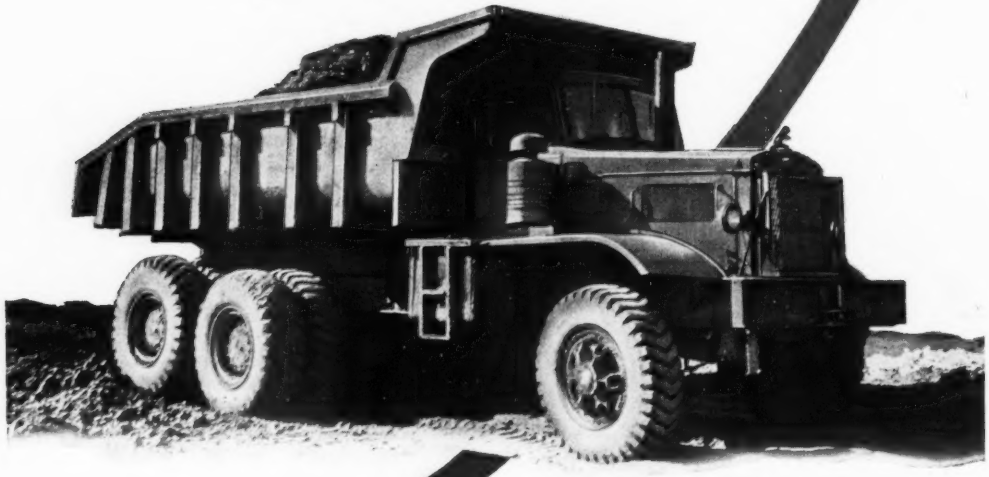
MACK TRUCKS
Built to *take it*
... and TAKE IT AWAY

in bigger loads ... on faster schedules ... with greater profits

Mack six-wheel trucks are built to "take it" when it comes to taking out the big loads with power and stamina to spare.

Powerful gasoline or diesel engines! Massive, heat-treated alloy steel frames! Flexible rubber Shock Insulators! Air Assist Clutch and Power Steering! Mack's famed Balanced Bogie and Power Divider! These are your assurance of power and strength for the heaviest loads; maneuverability and ease of control for fast loading and unloading; flotation and traction for the most slippery mud or sand.

Whether for heavy highway hauling or super-duty off-highway work, Macks are designed with more outstanding and exclusive features than any other truck—features that mean greater profits through stepped-up tonnage on faster schedules. It will pay you to get the full story in terms of your particular operation. Write or call your nearest Mack branch or dealer.



IT'S PART OF THE LANGUAGE: *Built Like a* **Mack** *Truck*

Mack Trucks, Inc., Empire State Building, New York 1, New York. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Limited.

the 13th roll in the baker's dozen

For really tough jobs, where you fight to keep costs down, count on 13 to the dozen with CRUCIBLE Hollow Drill Steel. Here's why—

CRUCIBLE, top name for generations in tool and alloy steels, has always thought in terms of units, not tons . . . and every length you use guards that reputation.

Moreover, *only* from CRUCIBLE can you get fast field service when you need it, from engineers who know your business — men whose own abilities are backed by an unsurpassed metallurgical staff. Finally, in carbon or special alloy, you can get the drill steel you need . . . promptly, anywhere.

That's why, with experience, men and the *right* steel immediately available, CRUCIBLE gives you the 13th roll in the baker's dozen—the extra foot that helps you keep below estimated costs and provides a proven aid to profit.

CRUCIBLE first name in special purpose steels

HOLLOW DRILL STEEL

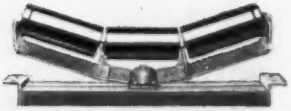
CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, 405 Lexington Ave., New York 17, N. Y.

Branches, Warehouses, and Distributors in Principal Cities. Consult your Telephone Directory or Thomas' Register for Nearest Office.

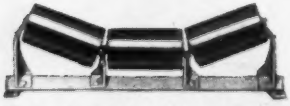
HIGH SPEED • TOOL • STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

You'll get *Big Returns* from this return idler!

Rex Style No. 35 Impact Cushioning Idler . . . dual purpose rubber rolls cushion shocks at loading points . . . minimize belt rupture and lacerations.



Rex No. 33 Self-Aligning Troughing Idler . . . used at intervals to align belt where off-center loading, side-wind drifting and uneven stretch are problems.



Rex No. 32 Troughing Idler . . . is roller-bearing equipped, can be furnished with steel or gray iron rolls. Has no shelves or pockets to catch dust . . . is self-cleaning.

Rex No. T-6 Flat Belt and No. T-1 Return Idlers . . . are dead shaft type idlers. They are equipped for high pressure grease lubrication . . . have hydraulic type fittings.

AN INVESTMENT in Rex Rubber-Covered Spiral Return Idlers will return big dividends in longer idler life, fewer conveyor breakdowns with less lost production time.

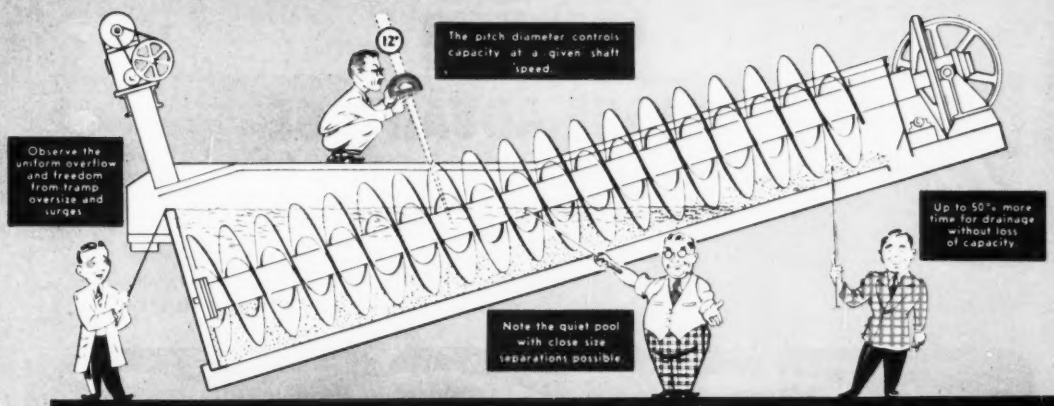
Why?

Because this patented return idler provides an ever-changing point of contact between the belt and idler. Ice, abrasive, corrosive and sticky material cannot build up on the idler and cause premature wear and operating difficulties. And the rubber-to-rubber contact between idler and belt reduces wear on the idler to the minimum.

Rex Rubber-Covered Spiral Return Idlers are made of flat-bar steel helical spirals covered with rubber. The spiral is mounted on a standard Rex Unit Roller Bearing Assembly Tube . . . the famous tube design that leads the idler field in long-life service. Spiral has left and right-hand sections to insure centering of the belt.

Install a few of these cost-cutting return idlers immediately following the head pulley of your conveyors and watch the returns you get in smooth, trouble-free service. A Rex Idler Specialist will be glad to give you the complete story. Or if you prefer, send for Bulletin No. 48-41. Address Chain Belt Company, 1679 West Bruce Street, Milwaukee 4, Wis.

CHAIN BELT COMPANY — REX — BELT CONVEYOR IDLERS


12°
The pitch diameter controls capacity at a given shaft speed.
Observe the uniform overflow and freedom from tramp oversize and surges.
Up to 50% more time for drainage without loss of capacity.
Note the quiet pool with close size separations possible.

AKINS design shows why It's FPM (not RPM) that counts in conveying capacities of Spiral Classifiers

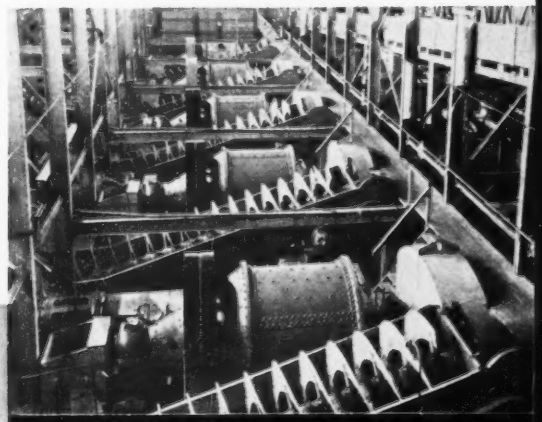
In an AKINS-type classifier, the revolving speed, or RPM, has much less to do with conveying capacity and classification results than the longitudinal speed, or FPM (feet per minute), of the sand moving out of the tank. AKINS machines are designed to operate within the proper speed ranges to give the results you want . . .

Dewatering and final elimination of undesirable fines takes place on the drainage deck above the settling pool of an AKINS. This is where FPM counts. The AKINS classifier conveys the sands slowly along the drainage deck, giving ample time for the production of clean sands.

FPM also counts in the AKINS pool. Too rapid travel reduces the time allowed below the minimum necessary for the undersize material to work out of the settled sand bed and to report in the overflow, where it belongs.

Only the 12° AKINS pitch gives the low FPM (and adequate raking capacity) that is required to give these important classification results. Under most operating conditions, a spiral with a greater, or advanced, pitch delivers a finished product of appreciably lower quality according to field and laboratory studies.

Our factory engineers are qualified to give you expert assistance in the fields of classification, cleaning, dewatering, densifying, desliming and Heavy Media separation. This service is yours for the asking. For on-time delivery, machines that are designed to your job and built to last, and service whenever you want it, you can safely rely on the experience and reputation of AKINS engineers and machines.



AKINS Classifiers reclaiming copper from old tailings in Upper Michigan; section of grinding floor, Quincy Mining Company.

COLORADO IRON WORKS COMPANY

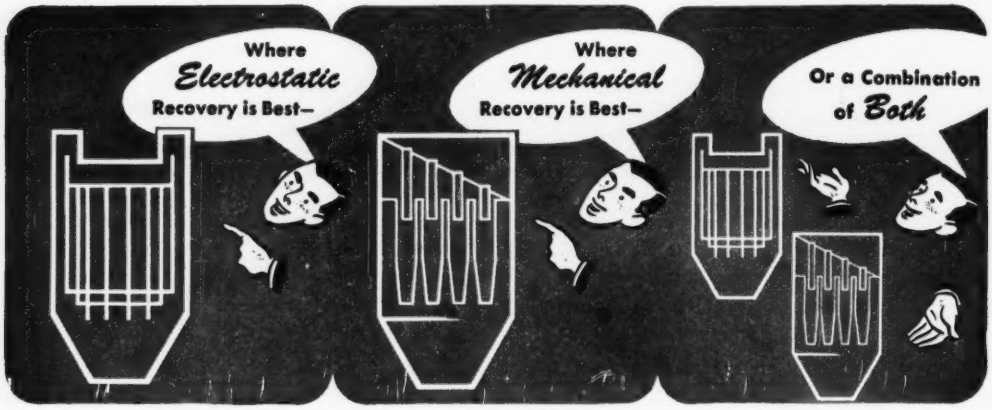
MAIN OFFICE & WORKS, DENVER 2, COLO., U. S. A.

Canadian Locomotive Co., Ltd., Kingston, Ont., Can., Head, Wrightson & Co., Ltd.; Stockton on Tees, Eng.; John Carruthers & Co., (Pty.) Ltd., Sydney, Aus.; Vancouver Iron Works, Ltd., Vancouver, B. C., Can.; Head, Wrightson & Co., S. A., (Pty.) Ltd., Johannesburg; Edw. J. Nell Co., Manila, P. I.

This is the UNIQUE ADVANTAGE

Western Precipitation provides for simplifying YOUR Dust Recovery Problems . . .

If you are not sure whether yours is a job for Cottrell or mechanical separation methods, you'll get an unbiased recommendation from Western Precipitation Corporation because this organization designs, engineers and installs BOTH!



THE COTTRELL ELECTRICAL PRECIPITATOR

Western Precipitation is the organization that pioneered the first commercial application of the now-famous Cottrell Electrical Precipitator. And its unique advancements and refinements in the basic methods, developed through more than 38 years of first-hand experience in Cottrell installations, assure you of the most modern in electrostatic recovery equipment from Western Precipitation Corporation. Cottrells handle dust, fume, fly ash, mists and other suspensions with high efficiency.

THE *MULTICLONE* MECHANICAL COLLECTOR

Companion to the Cottrell is Western Precipitation's widely used *Multiclone* equipment which offers far-reaching advantages in the mechanical separation of solids from gases. Its unique vane design makes possible multiple *small*-diameter separating tubes that combine high recovery efficiency with maximum compactness, minimum maintenance and wide-range adaptability to varying installation requirements. For mechanical recovery of solids, *Multiclone* is unsurpassed in operating efficiency, economy and installation simplicity.

COTTRELL AND MULTICLONE

And here's a priceless advantage provided by Western Precipitation Corporation . . . Frequently there are recovery problems where maximum efficiency and economy in first cost are obtained by using *Cottrell* and *Multiclone* equipment working together. There are many such recovery jobs—fly ash is one, perhaps yours is another—and you can get such a combination installation from one organization, under one responsibility, with one overall guarantee by bringing your recovery problem to Western Precipitation Corporation.

Send for these MULTICLONE and COTTRELL booklets!

REGARDLESS OF YOUR RECOVERY PROBLEM OR YOUR LOCATION

you can benefit by Western Precipitation's leadership and long experience in the science of recovering suspensions of all kinds—both liquid and dry—from gases, hot and cold. Western Precipitation Corporation installed the first successful Cottrell which is still in operation after 35 years of service. No matter what your industry, Western Precipitation is prepared to serve you in *all* parts of the world. Write, wire or call our nearest office.

WESTERN Precipitation CORPORATION

ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

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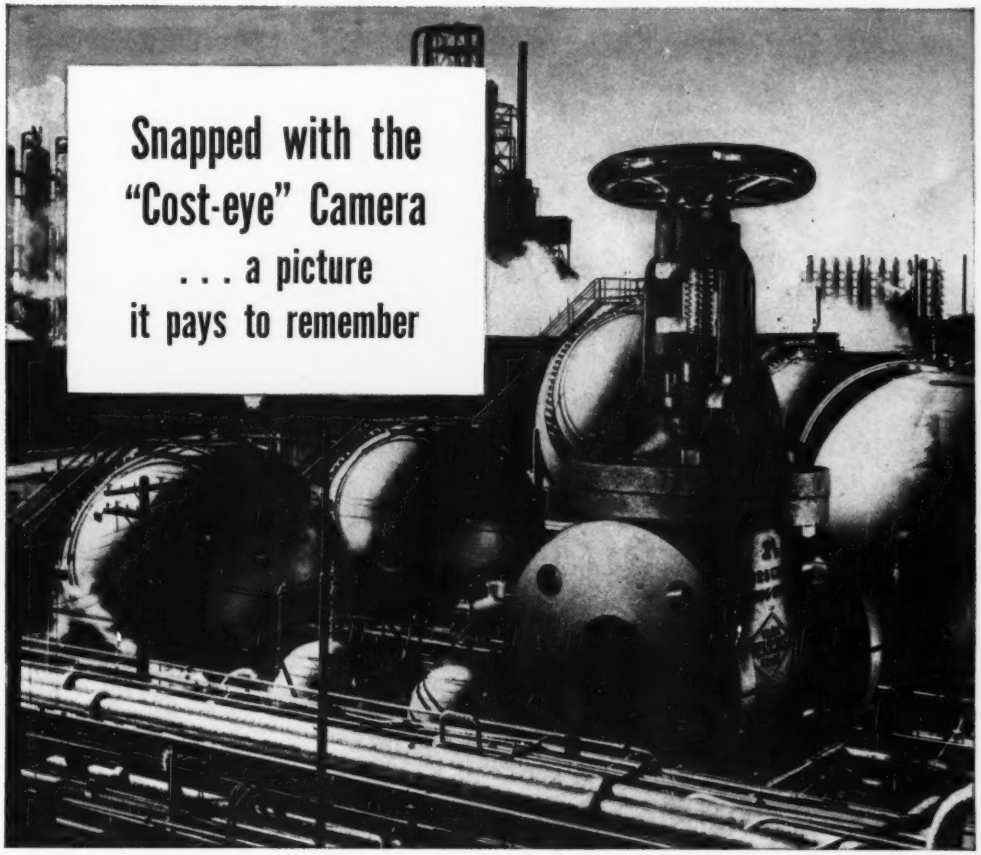
PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

NOW SELLING...

COTTRELL Precipitators
MULTICLONE Collectors
TURBULAIRE Spray Dryers



IF A CAMERA could be constructed with an eye to costs, this is the picture you'd get of a synthetic rubber plant. By showing *all valves* as *one valve* it brings into proper perspective the valve investment in *any* plant, *any* large building where operation involves fluid control. Collectively, valves represent a major expenditure . . . yet too often, they are selected with "petty cash" consideration.

IT WILL PAY MANAGEMENT to keep this picture in mind. With wages and material costs the highest ever, valve maintenance costs must be watched as carefully as operating expense of larger plant units.

EXCESSIVE MAINTENANCE of one inferior valve is insignificant, but multiplied by thousands, it is a serious drain on operating budgets.

JENKINS BROS. helps you meet this problem two ways. First, by building extra endurance into Jenkins Valves, making them the longest-lasting, lowest-upkeep valves that money can buy. Second, with advice from Jenkins Engineers on any question of proper selection, installation, inspection or maintenance.

For all new installations, for all replacements, rely on Jenkins quality and engineering for lowest valve costs in the long run. *Sold through leading Industrial Distributors everywhere.*

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Jenkins Bros., 80 White St., New York 13; Bridgeport, Conn.; Atlanta; Boston; Philadelphia; Chicago; San Francisco. Jenkins Bros., Ltd., Montreal.

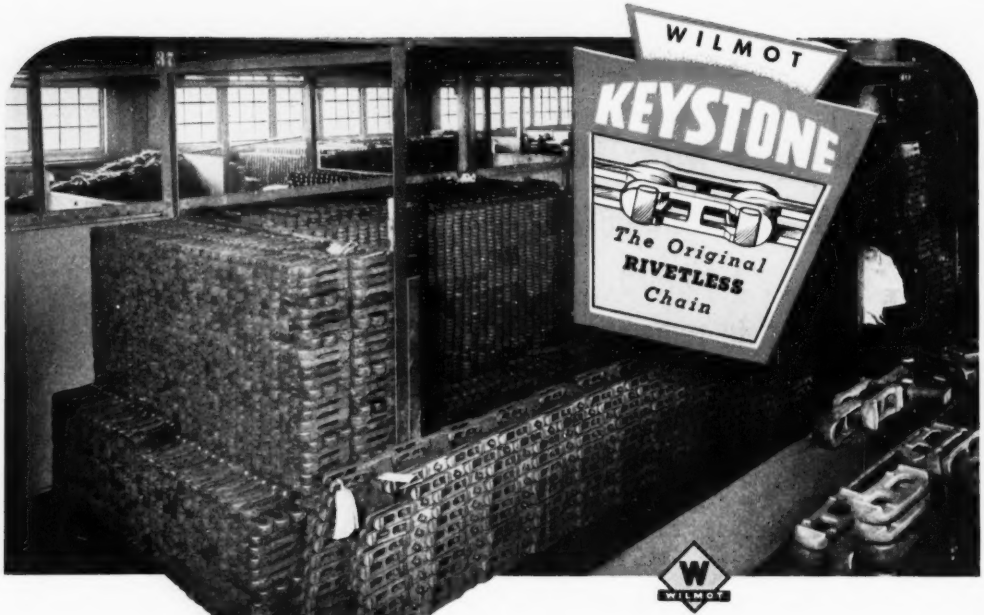
"PREVENT VALVE FAILURE" is a 28-page guide to valve economy, fully illustrated, with case histories of valve damage, and recommendations for its prevention by proper selection, installation, inspection, and maintenance. FREE on request. Write: JENKINS BROS., 80 White St., New York 13, N. Y.

LOOK FOR THIS JENKINS DIAMOND MARK

SINCE 1864 Jenkins Bros.

JENKINS VALVES

Types, Sizes, Pressures, Metals for Every Need



WILMOT STOCKS *More* CHAIN SIZES

and Types of Attachments

Designed and originated by Wilmot, "Keystone Rivetless" chain has been serving American industry for over 40 years. This widely-recognized, heavy-duty chain is used in many types and makes of elevators and conveyors. To supply the needs of both the builders and users of such equipment, we manufacture the widest selection of chain sizes available.

Pictured above is a section of our chain house. Here we endeavor to stock, for prompt shipment, all specified sizes, in pitches from 3" to 10½" and in working loads from 3,000 to 128,000 lbs. Also a wide choice of materials: drop forged steel--high carbon, normalized, heat-treated; and alloy steels.

We also manufacture and stock the largest selection of attachments, for every purpose.

For complete details send for the catalog below.

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NEW 280-PAGE
BOOK ON CHAINS
Conveyors, Elevators

Full engineering data for designers or maintainers of hauls, conveyors or elevators. Abundantly illustrated.

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Wilmot Coal Preparation Equipment: Hydrotators • Hydrotator-Classifiers • Hydro-Separators • Simplex Jigs Crushing Rolls • Sizing Shakers • Bucket Elevators • Conveyors • Car Hauls • Keystone Rivetless Chain, etc.

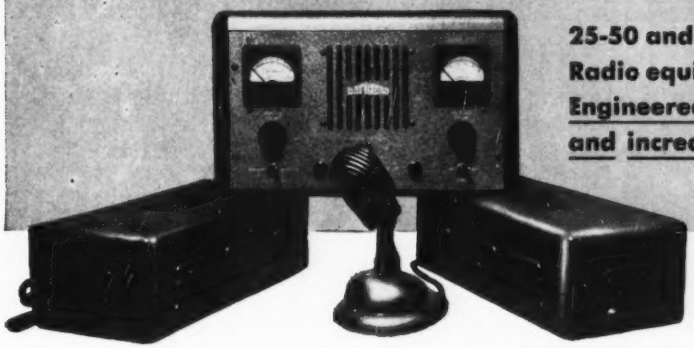
WILMOT BUILDS BETTER BREAKERS

for dependable *2-Way* radio communications it's . . .

RAYTHEON RADIOPHONE

Now It's Here!

VM 30-1—30 Watt Mobile Station, 25-50 Megacycle



25-50 and 152-162 Megacycle Radio equipment that's Engineered for dependability and increased efficiency!

VS 50-1
50 Watt Fixed Station
25-50 Megacycle

UM 15-1—152-162 Megacycle (not illustrated)

COMPARE RAYTHEON'S ADVANTAGES!

NOISE-FREE RECEPTION
COMPACT • OUT OF SIGHT
SIMPLIFIED INSTALLATION

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LOW BATTERY DRAIN
LOW MAINTENANCE • LONG LIFE

COMPARE RAYTHEON'S PRICE!

LOWEST PRICE IN THE INDUSTRY!
WRITE FOR QUOTATIONS AND SPECIFICATIONS

Our sales engineers will assist you in filing your FCC construction permit at no cost or obligation to you!

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Unfrightened by dire predictions, leaders of American business always have planned with confidence in the future . . . and, in the long run, their faith has paid off. Such courageous leadership helps to *create* good business.

Good business means jobs for those who want to work. It's the best defense against the termites who are working to undermine the individual liberties Americans enjoy.

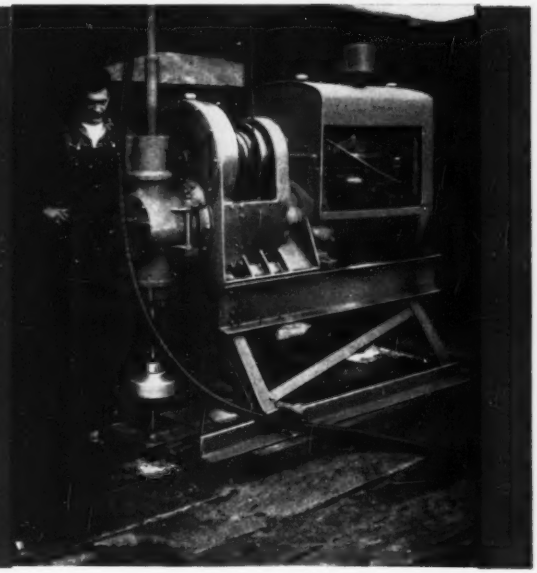
6593

SKF INDUSTRIES, INC. PHILADELPHIA
BALL and ROLLER BEARINGS

• Core Drill For Values

WITH A

LONGYEAR UG STRAITLINE



Potential wealth in your mineral property is of little use until actual values are disclosed by a few well placed drill holes.

Diamond core drilling will reveal the nature of material penetrated, the location and size of your orebody. The grade of ore can be determined by analysis of core and sludge samples recovered.

Deep drilling may be required—depths to 2000 feet. Gasoline or diesel driven, the Longyear UG Straitline has the power and stamina for just such service. Air or electric models are also available. Vertical or angle holes can be drilled. Manual controls conveniently located, govern bit advance and speed, also lowering and hoisting of drill rods. A 4-speed transmission conveys power to the hoist, or to the drilling head which may be either a hydraulic or screw feed type.

● Drilling capacities are: 2000′ of $\frac{7}{8}$″ core; 1600′ of $1\frac{1}{8}$″ core; 1200′ of $1\frac{5}{8}$″ core; 1100′ of $2\frac{1}{8}$″ core.

A Longyear UG Straitline will prove up values in your property.

Write for Bulletin No. 57

Longyear core drills are manufactured in a variety of sizes and models with capacities from 100′ to 8500′. Longyear rods, bits, core barrels and other supplies are carried in standard sizes.

E. J. LONGYEAR COMPANY

MINNEAPOLIS, MINNESOTA, U.S.A. NEW YORK OFFICE: 122 E. 42nd STREET

CANADIAN LONGYEAR, LIMITED, NORTH BAY, ONTARIO, CANADA

DIAMOND CORE DRILLS • CONTRACT CORE DRILLING
SHAFT SINKING • GEOLOGICAL INVESTIGATIONS

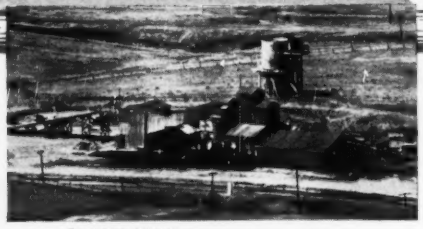
REPRESENTATIVES IN PRINCIPAL MINING CENTERS IN THE UNITED STATES AND OTHER COUNTRIES

Cutting Costs with TELSMITH Equipment

ARIZONA Mill of Shattuck-Denn Mining Corporation, at Bisbee, Arizona

These mills have found the practical ways to cut costs today—through more efficient production . . . with new methods and new machines or by properly planned plant modernization. They use Telsmith modern crushers, feeders and screens to get increased plant capacity and a finer product. Telsmith equipment also means lowest power requirements . . . less supervision . . . minimum upkeep expense. Consult Telsmith engineers. No cost or obligation, of course. *Send for Bulletin E-1.*

COLORADO Mill of Shenandoah-Dives Mining Co., Silverton, Colorado



CALIFORNIA Castro Chrome Associates chrome concentrating plant near San Luis Obispo

MINNESOTA Virginia Mine at Eveleth, Minn., operated by Snyder Mining Co., Duluth

IDAHO Coeur d'Alene Mines Corp. 600-ton capacity mill near Osborne, Idaho

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Bull Dog Industrial V-Belts are available in A, B, C, D and E sections, full range of lengths
Fractional Horsepower FHP V-Belts are available in three standard sections, full range of lengths

LESS SLIPPAGE! COOLER RUNNING! LONGER LASTING!

NO WONDER THERE'S INCREASING DEMAND FOR

RUGGED BULL DOG V-BELTS

On tough jobs where a dependable V-Belt drive is of utmost importance, operators today are specifying Bull Dog V-Belts.

These new BWH "titans" have consistently proved they deliver the kind of steady, trouble-free service that speeds production and slashes maintenance costs.

Here's why there's less slippage with Bull Dog V-Belts, fewer shutdowns for adjustments, greater long-term economy in their use:

1. *Exclusive Bull Dog Cord Section Has Higher Tensile Strength,* able to carry the load and absorb shock.

2. *Low Stretch,* because exclusive Bull Dog Cords are processed in a new way. As a result, there's less slippage, fewer adjustments, longer belt life.

3. *Cool Running,* thanks to quality-controlled compounds developed in BWH laboratories, which do not crack or deteriorate under the most severe flexing.

4. *Wear-Resistant Covers* of heavy, bias-cut fabric, to protect heart of belt from dirt, grease and moisture.

Bull Dog V-Belts are one of many famous products manufactured by BWH. When you need industrial rubber goods, look to BWH for products of dependable ruggedness, to BWH distributors for dependable service.

HAVE YOU A JOB WHERE STAMINA COUNTS?
Bring us your toughest problems. We're specialists in solving them. Consult your nearby BWH distributor or write us direct.

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all principal cities

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"NITRAMON" and "NITRAMEX"

ideal pair for safe, efficient open pit blasting

These two Du Pont blasting agents provide the safest, most efficient known means of open pit blasting. "Nitramon"† is used for normal shooting, but where toe conditions are difficult, "Nitramex"* is loaded in the bottom of the holes. The resulting blasts produce an abundance of well-broken rock that facilitates digging and removal of profitable ore.

The extra strength of "Nitramex" (approximating that of 75% Gelatin) frequently allows wider drill hole spacing with consequent reduction of drilling costs.

They are both insensitive to blasting caps, friction, or the impact of falling objects. Even rifle bullets won't detonate them. And yet, a "Nitramon" Primer—itself relatively insensitive—dependably fires large or small charges. No safer blasting agents are known.

Packed in rugged metal, watertight containers—"Nitramon" and "Nitramex" may be safely loaded far in advance of firing time. Another feature: they're non-headache-producing . . . an advantage in hot weather. Ask any Du Pont Explosives representative for complete information.

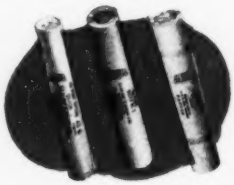
E. I. DU PONT DE NEMOURS & CO. (INC.)

EXPLOSIVES DEPARTMENT • WILMINGTON 98, DELAWARE

DU PONT EXPLOSIVES

BLASTING SUPPLIES AND ACCESSORIES

. . . and for economical underground ore mining:



DU PONT SPECIAL GELATIN

Popular, high velocity dynamite of excellent water-resisting characteristics. It's plastic . . . cohesive . . . easily tamped . . . stays put in uppers. Best obtainable fumes.

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DU PONT "GELEX"**

This semi-gelatinous dynamite is widely used and economically meets almost all requirements. Has ample strength to break up all but the very hardest rock. Fumes are very good.

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DU PONT "EXTRA" DYNAMITES

These are efficient, economical dynamites for use in soft ores where the work is relatively dry.

Listen to "Cavalcade of America"—Monday evenings—NBC

†Reg. Trade-Mark for nitrocarbonitrate blasting agent.

*Trade-Mark for Du Pont ammonium nitrate blasting agent.

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DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING

. . . THROUGH CHEMISTRY

CREATING *nothing* TO ASSURE LONG LASTING SERVICE

QUAKER HOSE IS VACUUM "PRE-TESTED" FOR STRENGTH OF WALLS . . . DURABILITY IN THE MINING INDUSTRY

If it has the Quaker trade-mark, it must be right . . . each type of hose must meet rigid "pre-tests" before it is shipped for service in the mining industry. Scientific pre-tests that subject hose to torture-tests more severe than will ever be encountered above or below the ground, are conducted right in Quaker plants.

One of these steps in "pre-testing" Quaker Hose is shown above. A vacuum test that puts Quaker Hose through the paces to provide rubber products for the mining industry that are second to none in quality.

This is only one of the eighteen rigid tests that raw materials and finished products must pass before receiving the Quaker stamp of approval. Yes, "pre-testing" of Quaker belting, hose and packings provides quality and long service . . . assures worthwhile dividends for your operations through less time outs for maintenance, higher efficiency, lower cost per ton mined.

PACKINGS THAT PRESERVE POWER

Quaker pump packings are pre-tested for size, shape and quality to assure perfect fit, long service, maximum power.

BELTS THAT BOOST POWER

Quaker's complete line of conveyor and transmission belting for every type of mine requirement, is pre-tested and service-proved to provide sure-grip...slip less . . . save power.

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THOR MODEL 75
SINKER ROCK DRILL

MORE SHAFTS

ARE SUNK WITH THE THOR "75" THAN WITH ANY OTHER SINKER!

If any one fact stands out in the preference for Thor's great 55-pound sinker among mine operators *this is it.*

Sinking the mine shaft is the toughest test for any sinker . . . yet, in test after test against rigid competition, Thor's "75" outdrills every machine in its class . . . has been the standout choice for more shaft sinking operations than any other sinker!

See the preferred sinker *first* . . . at Thor distributors everywhere, or write for Catalog MC1.

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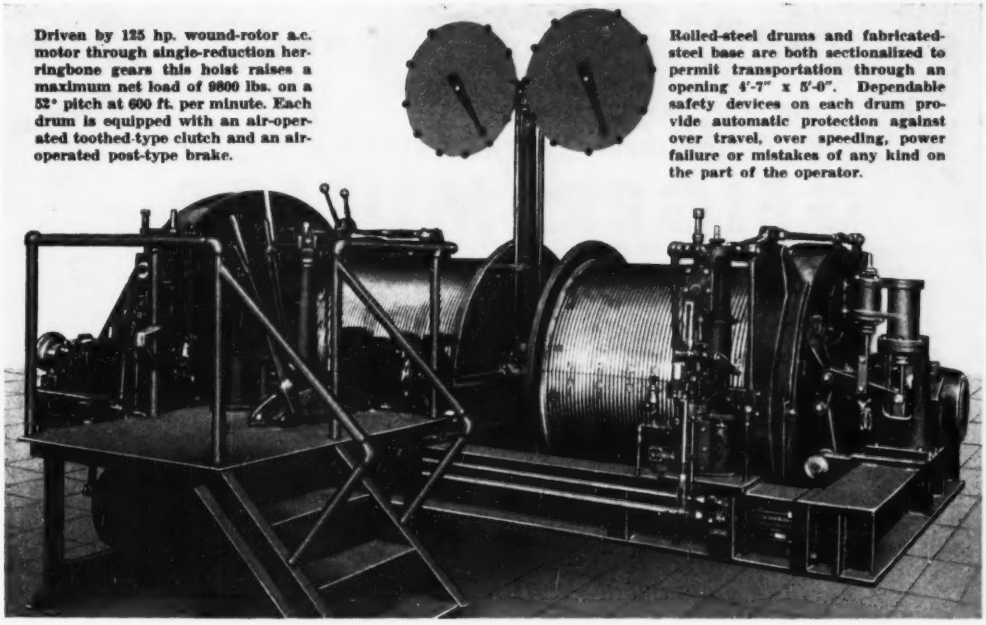
Thor PORTABLE POWER TOOLS

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

Driven by 125 hp. wound-rotor a.c. motor through single-reduction herringbone gears this hoist raises a maximum net load of 9800 lbs. on a 52° pitch at 600 ft. per minute. Each drum is equipped with an air-operated toothed-type clutch and an air-operated post-type brake.

Rolled-steel drums and fabricated-steel base are both sectionalized to permit transportation through an opening 4'-7" x 5'-0". Dependable safety devices on each drum provide automatic protection against over travel, over speeding, power failure or mistakes of any kind on the part of the operator.



FOR UNDERGROUND OPERATION
IN A NEW JERSEY ZINC MINE

This double-drum hoist had to be lowered down an inclined shaft and transported a considerable distance underground through openings as small as 4'-7" x 5'-0". That meant sectionalized design and construction.

Hoisting from a number of different levels required a separate clutch and brake for each drum. Safe, high-speed, efficient operation required correct dimensions and proportions of all parts; ample factors of safety throughout; high-torque electrical power under finger-tip control and dependable safety devices on each of the two rolled-steel drums.

SATISFACTORY SERVICE for the past three years has proved that Vulcan engineers, working in close cooperation with the purchaser's engineers, produced the right hoist for the job—as they have for scores of other leading mining companies during the past hundred years.

Write us regarding any present or prospective hoisting requirement. Our engineers welcome opportunities to make money-saving suggestions, whenever possible, without charge or obligation.

Two sectionalized Vulcan Allcasteel Sheaves were furnished with this hoist. Besides being light, strong and tough they are so highly resistant to rope wear that NO LINERS ARE NEEDED. Available in all sizes, with either plain or anti-friction bearings.

1849 VULCAN CENTENNIAL 1949

Vulcan Iron Works
WILKES-BARRE, PA., U.S.A.

Other Vulcan products include Cages and Skips, Shaking-Chute and Chain Conveyors, Rotary Kilns and all types of Locomotives for underground and surface haulage. Write for illustrated bulletins.

El-Tronics INC.

FINEST "IN THE FIELD!"

GEIGER MÜLLER

Portable

SURVEY INSTRUMENTS

URANIUM ORE

MODEL SM3

Here is the finest portable survey instrument made for tracking down elusive uranium ores. Of lightweight welded aluminum construction it weighs only 8¾ pounds, is completely waterproof and can be carried anywhere. A self-contained Geiger-Muller counter tube probe unit attached to the instrument by a 30" cable makes taking measurements in crevices and confined places an easy matter. Radiation intensities can be read in a few seconds directly from the indicating meter. Its three full scale ranges detect the most sensitive impulses, with instantaneous accuracy. Backed by 14 years of design experience, the SM3 is ideally suited to rugged use in the field without sacrificing any of the delicate sensitivity of laboratory equipment.

Outstanding Features:

- Battery life in excess of 200 hours
- No Tools necessary to replace batteries
- Instantaneous readings directly from scale of 3" meter
- Uses standard miniature type radio tubes
- Counter tube sensitive to both Beta and Gamma radiation
- Complete and ready for operation **$225**

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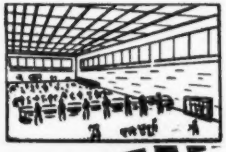
America's Foremost Crafters Of Scientific Equipment

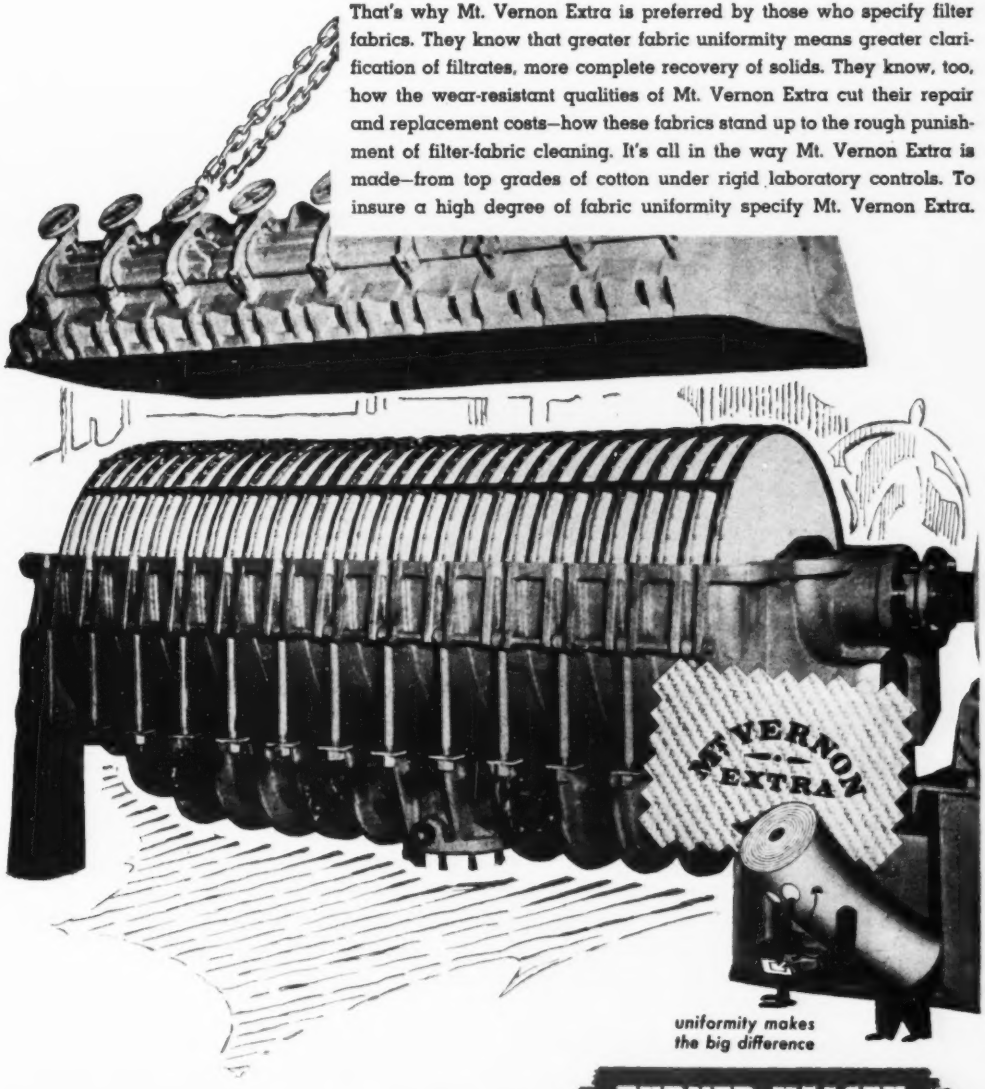
A COMPLETELY EQUIPPED PRECISION ELECTRONICS PLANT TO SERVE YOU

El-Tronics offers unexcelled production facilities for the manufacture and assembly of precision electronic equipment of all kinds. Our plant offers excellent tooling, skilled engineering and highly trained craftsmen. Call on us for a discussion of your requirements.



Filtering Starts with the Fabric

Filtering efficiency depends to a great degree on fabric uniformity. That's why Mt. Vernon Extra is preferred by those who specify filter fabrics. They know that greater fabric uniformity means greater clarification of filtrates, more complete recovery of solids. They know, too, how the wear-resistant qualities of Mt. Vernon Extra cut their repair and replacement costs—how these fabrics stand up to the rough punishment of filter-fabric cleaning. It's all in the way Mt. Vernon Extra is made—from top grades of cotton under rigid laboratory controls. To insure a high degree of fabric uniformity specify Mt. Vernon Extra.



uniformity makes the big difference

Mt. Vernon-Woodberry Mills

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40 WORTH ST. • NEW YORK

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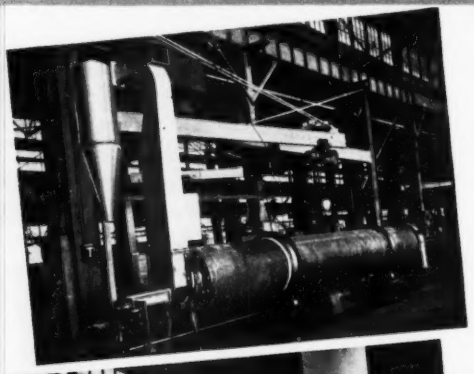

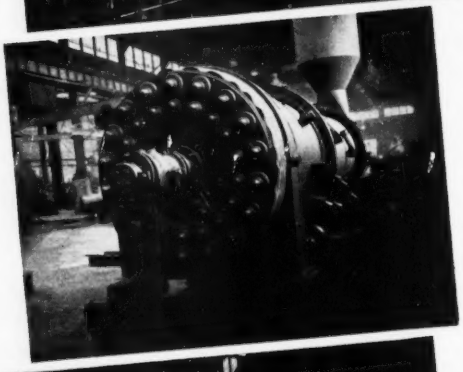

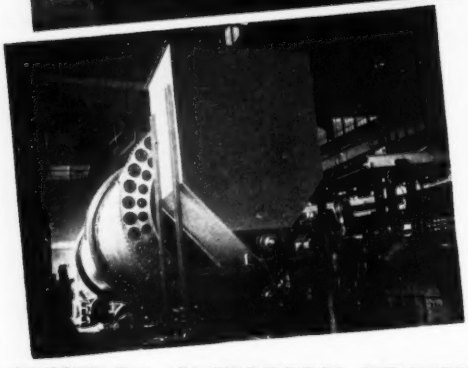

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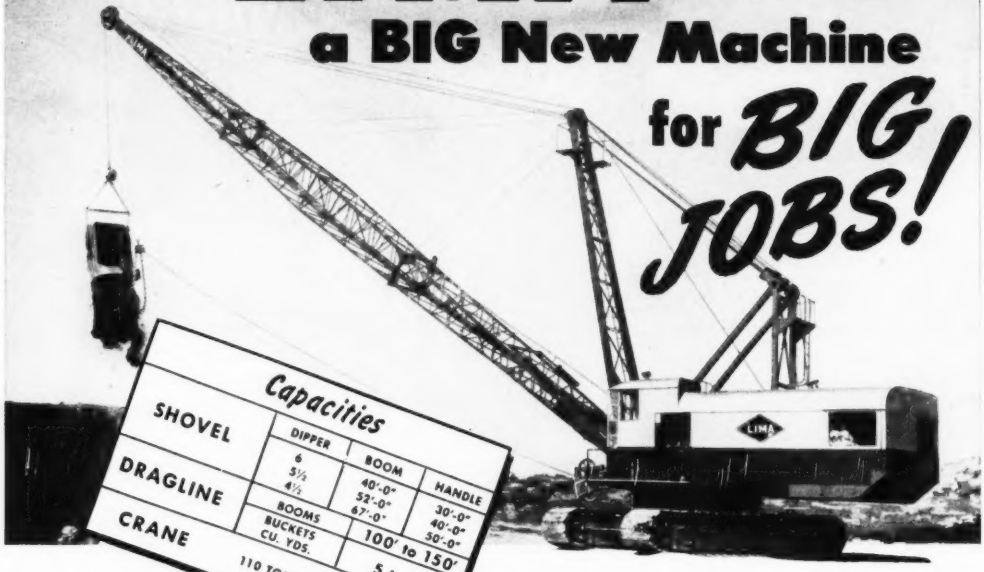

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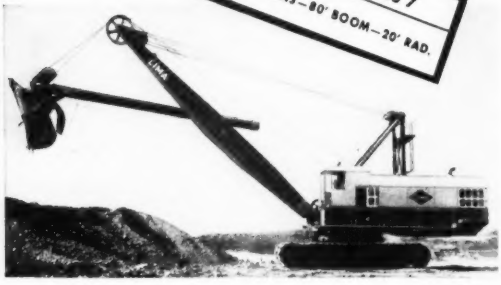
DRAGLINE	BOOMS	100' to 150'	
	BUCKETS CU. YDS.	5 to 7	
CRANE	110 TONS—80' BOOM—20' RAD.		



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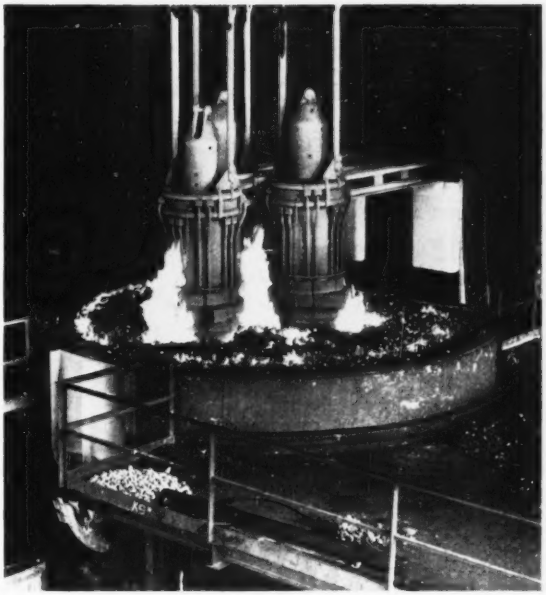

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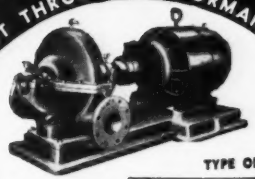

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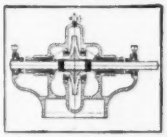

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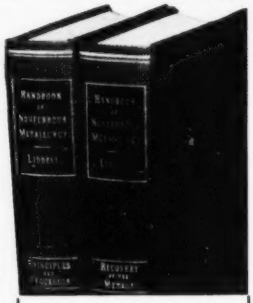

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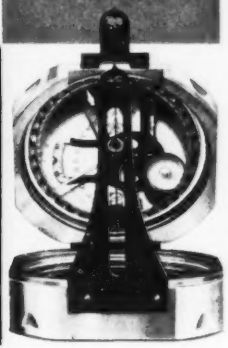

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These powerful service tools Pull gears, wheels, bearings and bushings from shafts, easily and quickly. They eliminate pounding, battering and breakage of vital machine parts. They make tedious and risky jobs fast and safe. They usually pay for themselves in the first job, and give years of satisfying service.

12 types, 40 sizes (including special designs for special application, with drop forged arms and heat treated forcing screws.

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ARMSTRONG-BRAY & CO.
5322 Northwest Highway
Chicago 30, Illinois

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Most accurately and economically tested for . . . with the

EMPIRE DRILL

NEW YORK ENGINEERING COMPANY
75 West St., N. Y. City, U.S.A. Cable Address NYECO, N.Y.

EFFECTIVE LUBRICATION *in spite of* **moisture**

Operation of production machinery in the presence of moisture, steam and acids has always been a serious problem in many processing industries. There are a number of **LUBRIPLATE** Lubricants that satisfactorily meet these unfavorable operating conditions, thereby protecting machine parts against rust and corrosion.

Write for a copy of "The LUBRIPLATE FILM" written especially for your industry.

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DEALERS FROM COAST TO COAST
CONSULT YOUR CLASSIFIED TELEPHONE BOOK

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EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

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NEW ADVERTISEMENTS received by 10 A.M. April 20th will appear in the issue of May subject to limitations of space available.

REPLIES (Box No.): Address to office nearest you.
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

JUNIOR MINE Engineer, college graduate, competent underground surveyor draftsman, standard three year contract, knowledge Spanish desirable, starting base salary $2700 yearly plus bonus one month yearly, single, free transportation to Bolivia by air, four weeks' vacation yearly, free living quarters. P-8237, Engineering & Mining Jl.

FIRST-CLASS Electrical Designer for work large mining organization, Chile, South America. General knowledge electrical applications and generation, transmission and utilization of electric power desired. Must be familiar with installations for hydro-electric generating stations, substations, transmission lines, switchboards, industrial control, motors, hoists, and industrial electric railway equipment and know good deal of the theory involved in such applications. Should be able to turn out finished drawings with bills of material in preparation of requisitions covering material involved in his drawings. 3-year contract. Transportation both ways and salary while traveling paid by company. In reply give complete details. P-8201, Engineering & Mining Jl.

MINE FOREMAN, college graduate, experienced metal miner, standard three-year contract, single status or if married single status for six months, working knowledge Spanish essential. Starting base salary $4800 yearly plus bonus one month yearly, free transportation to Bolivia by air for employee and wife, four weeks' vacation yearly, free living quarters. P-8238, Engineering & Mining Jl.

SMELTER FIELD Engineer for large copper company, Chile, South America. 4-year contract. Transportation both ways and salary while traveling paid by company. In reply give complete details. P-8203, Engineering & Mining Jl.

STATE SURVEY in Mid-South desires geologist, preferably with industrial minerals experience. Salary open, depending on experience. P-8514, Engineering & Mining Jl.

WANTED

Assistant Mill Superintendent and Metallurgist for lead-zinc flotation mill in Bolivia. Three-year contract. Annual salary $4,500.

Staff Geologists (three), for operating mines in Bolivia. Underground and surface mapping, diamond drill supervision, outside studies. Latin American experience desirable. Preferably single. Salary up to $4,500 annually, three-year contract.

Mining Engineer — graduate, to operate tungsten mine in Bolivia, small production at present; carry on development program and expansion studies for increasing output. Previous South American experience essential. Salary depending upon qualifications up to $4,800.

P8307 Engineering & Mining Journal, 330 West 42nd St., New York 18, N. Y.

Sales Engineers Wanted

Young men for sales work by manufacturer of heavy machinery. Knowledge of crushing, milling and processing as related to mining and aggregate and cement production advantageous but not necessary. Qualified applicants afforded opportunity for rapid advancement. Give full particulars; age, education, previous experience in these industries and present position. All replies confidential. Our Sales Department has been advised of this advertisement.

SW 8259 Engineering & Mining Journal 520 N. Michigan Ave., Chicago 11, Ill.

POSITIONS VACANT

METALLURGIST - MILL Foreman, college graduate, experienced ore dresser and mill operator, standard three-year contract, starting base salary $5,100 yearly plus bonus one month yearly, single status or if married single status for six months, working knowledge Spanish essential, free transportation to Bolivia by air for employee and wife, four weeks' vacation yearly, free living quarters. P-8239, Engineering & Mining Jl.

ASSISTANT CHIEF Mine Engineer for work large copper company, Chile, South America. 3-year contract. Transportation both ways and salary while traveling paid by company. In reply give complete details. P-8295, Engineering & Mining Jl.

JUNIOR METALLURGIST, college graduate, some experience ore dressing laboratory test work, standard three-year contract, starting base salary $3,000 yearly plus bonus one month yearly, single, knowledge Spanish desirable, transportation to Bolivia by air, four weeks' vacation yearly, free living quarters. P-8226, Engineering & Mining Jl.

WANTED: GEOPHYSICIST for teaching and research in active and well supported program. Professorship offered to properly qualified candidate. Ph.D. required. Also Stratigrapher for medium-sized Geology Department. Assistant Professorship with opportunity for advancement. Ph.D. required. North Central region. Cite experience and references. P-8379, Engineering & Mining Jl.

WANTED: EXPERIENCED Underground equipment repair man. Location, state of Washington. Pay commensurate with ability. Give full details regarding age, condition, family, experience, etc. Address reply to P-8271, Engineering & Mining Jl.

SELLING OPPORTUNITY OFFERED

MACHINERY FIRM operating West Coast South America has opening for Sales Engineer familiar with Mining and Milling machinery. General sales and service. Preferably graduate engineer with sales ability. Advise age, marital status, experience. Spanish advantageous but not essential. Reply SW 7973, Engineering & Mining Jl.

EMPLOYMENT SERVICE

ENGINEERS: LARGE college offers $3000, approx. half time teaching-studying. All ranks univ. positions, experienced $4500-$6000 nine months. Give phone, photo, qualifications. Cline Teachers Agency, East Lansing, Mich.

POSITIONS WANTED

MINING ENGINEER, Metallurgist, chemist, twenty years' varied experience in industry, has acted as assayer, millman, chemist, capable where mature judgment and experience required, desires responsible position. Complete resume of experience on request. PW-8371, Engineering & Mining Jl.

POSITIONS WANTED

MINING ENGINEER—Mining Geologist, eight years mine operation, shift boss to superintendent, six years mine examination and exploration, three years heavy construction, desires employment as superintendent or exploration engineer in the metal mining field. Excellent health, married, no children, will go anywhere. Available thirty days. PW-8437, Engineering & Mining Jl.

SUPERVISORY POSITION in ore dressing. Experienced superintendent and metallurgist. Gravity concentration, including sink float, flotation, cyanidation. M.S. degree. Age 39. PW-7449, Engineering & Mining Jl.

METALLURGICAL ENGINEER, 14 years' experience ore-dressing and selling Mexico and South America. Navy veteran, perfect Spanish and French. Available for position of responsibility sales engineering, operation, administration. PW-8269, Engineering & Mining Jl.

Continued on the opposite page

EXPERIENCED EXAMINING & EXPLORATION ENGINEER & GEOLOGIST age 41, capable, responsible, energetic, fluent Spanish, 17 years good experience lode mining and placer dredging exploration and operations with large organizations. 6 years South America in responsible positions. Able organizer, especially qualified for directing or carrying out Latin American work. Available for long or short assignments.
PW 8105 Engineering & Mining Journal 68 Post St., San Francisco 4, Calif.

When Writing Your Ad

Provide an indexing or subject word.

Write it as the first word of your ad.

If it is a Position Wanted or Position Vacant ad, make the first word the kind of position sought or offered.

This will assure proper classification in the column.

The right is reserved to reject, revise or properly classify all Want Advertisements.

Proper Classification

increases the possibility of

Prompt Returns

POSITIONS WANTED

(Continued from opposite page)

MILL-SUPT. Metallurgist. Married. B.S., Regis. Met. Engr. Wide experience operator, supt., and in original research complex lead-zinc-gold-silver-copper, gold, and non-sulphide copper and silver. Seeks permanent connection with responsibility in S. Wn. USA or Mexico. PW-8145, Engineering & Mining Jl.

GEOLOGIST AND Geophysicist with mining engineering experience. Age 35, married. One year oil geology southwest, six years Lake Superior iron mines. Supervisory capacity, magnetic surveying, underground structural and stratigraphic mapping, outcrop mapping, diamond drill operations and core classification. Require assurance of advancement, good salary, desirable housing for family. Excellent references. Employed. PW-8141, Engineering & Mining Jl.

BUSINESS OPPORTUNITIES

Inventor will sell
proven methods for separating fine minerals or make attractive deal for development. BO-8497, Engineering & Mining Jl.

For Lease: Fully equipped gold mine in Nevada to company able to finance further development on ore. BO-8510, Engineering & Mining Jl.

WANTED

Capital For Development or Will Sell on Royalty Basis

Bi Metals: Six patented claims. Free milling gold; open pit. Mill run of 10,000 tons average $5.00. Deposit or Blanket ledge 200,000 tons proven by pit, drilling, etc.
Mexican mine, four claims. Gold, Silver, Lead and Zinc. Opened by 300' tunnel, 200' of back ledge, 20' wide, 400 tons Cyanided $5.00 per ton. Samples taken from surface ahead of face of tunnel 2' wide in center of ledge ran from $20.00 to $40.00. Joins Golconda mine which produced four million dollars to a depth of 1400'.

Mohawk: Gold, Silver. Four claims, opened by tunnel 180'. Stoped to surface. Past production $41,000.

Have reports, etc., for above properties.

R. L. LAURENCE — KINGMAN, ARIZ.

WANTED

$50,000 For Stripping Job

Own complete new Bodinson Dredge installed ready for operation, 150 yards hour. Bedrock values average $3.50.

Darrell V. Cole. P.O. Box 157
Randsburg, Calif.

WANTED

Large engineering firm wishes to acquire several complete plants through purchase of (1) capital stock, (2) assets, (3) machinery and equipment, whole or in part. Personnel retained where possible, strictest confidence. *Box 1231, 1474 Broadway, New York 18, N. Y.*

SLUDGES WANTED

If you have any metallurgical or chemical by-product sludges which may contain rare or minor metals, please contact

Metallurgical Process Division
Saratoga Laboratories, Inc.
Saratoga Springs, New York

Sludges bought outright or recovery processes developed under contract.

BOUGHT ROCKBITS SOLD
*Most Types and Sizes.
ONE OF THE
*LARGEST DEALERS ON THE EAST COAST
*Send us your Quotation or Inquiry.

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EMPLOYMENT . . . EQUIPMENT . . . BUSINESS
OPPORTUNITIES
Whatever your need—
think "SEARCHLIGHT" FIRST

DIESEL ELECTRIC POWER FOR IMMEDIATE DELIVERY

A PARTIAL LISTING OF OUR INVENTORY
ALL ITEMS NEW OR RECONDITIONED

Generator Sets:

H.P.	MAKE	FUEL	KW	RPM	GEN.	PH.	CYL	VOLTS
510	Cooper-Bessemer	Diesel*	350	900	FM	3	60	2400
112	Caterpillar	Diesel	75	900	LA	3	60	220/440
90	Buda	Diesel	50	1200	Smith	3	60	220/440
76	Buda	Diesel	30	1800	Century	3	60	220/440
50	Cummins	Diesel	28	1200	FM	3	60	120/208
56	LeRoi	Gas**	25	1200	West	3	60	120/208
65	Hercules	Gas	25	1800	Masters	3	60	120/208

Oil Transformers:

KVA	MAKE	PRIMARY	SECONDARY	PH	CYL
125	GE	2400	240/480	1	60
150	Penn	2400	120/240	1	60
200	Penn	2400	120/240	1	60

*This unit can also be furnished as Gas-Diesel.
**This unit can also be furnished as Natural Gas or Butane.

WRITE FOR COMPLETE INFORMATION

EVERSON SUPPLY COMPANY

DEPT. C — 15712 S. LEAHY AVE. — BELLFLOWER, CALIF.
Phone: Torrey 7-3514

FOR SALE

Marcy ball mill, Humphrey's Spirals, pumps, motors and other surplus mill equipment. Also 800 and 100 KW Diesel generating plants. Inspect at Pacific Bridge Company, Park City, Utah, or contact Pacific Bridge Company, 333 Kearny, San Francisco.

MINING CORPORATION

(Nevada)

AND ASSETS

FOR SALE or LEASE

Liberal Terms

GOLD, SILVER, LEAD and ZINC

Seven full claims (unpatented), all mineralized, ore body opened up on 300-ft. level, low grade, measures over 100 ft., great possibilities of developing commercial ore below 300-ft. level. Surface might be profitably worked for gold with power shovel. Several shafts, a number of open cuts, and trenches. Main shaft 300-ft. vertical depth, timbered and lagged. No equipment.

Good desert road to property.

No adverse claims; no debts; or other liabilities.

GOLDORE MINES, INC.
130 South Virginia St.
Reno, Nevada

FOR SALE

7000-ft. # 4-3/ conductor 40-strands Neoprene jacketed Portable Cable with shielding over each conductor and ground wires, type SHD, for operation at 7,500-Volts or less, on 1,000-ft. reels, priced substantially below present market.

UNIVERSAL WIRE & CABLE CO.
EAstgate 7-4777
2662 Clybourn Avenue
Chicago 14, Illinois

FOR SALE

Link Belt Scraper Conveyor—24"x18"x18' with 20 HP, F.M. Motor.
Crude Crusher, with Gear head reduction motor, 220 V.
Belt Conveyor, 10'x20" complete.
Raymond Rotary Mixer, with 10 HP. Motor. Cleveland speed reducer.
Raymond Double Cage Mill, 60"x24" Water Cooled Bearings, driven by L.A. 75 HP. slip ring motor, chain drive, totally enclosed.
Raymond Double Cyclone Flash Dryer Complete, insulated cyclones.
Petro Mod. W-8 Oil Burner.
Federal Pneumatic Classifier, three cyclones, with selector gates, speed reducers, etc.
Jeffrey Spiral Conveyor, enclosed, 16"x6".
Jeffrey Spiral Conveyor, worms and drives only—58"x6"; two 15'x6"; 36'x6"; 12'x6".
Clarage Exhaust Fan, size 19 with 20 HP. Motor, 220 V. V-belt drive.
Write for price and complete detail on any item, to

Thomas E. Baley Industrial Machinery
Box 86 Waltham, Mass. — Tel. Waltham 5-2271

NEW & RECONDITIONED DIESELS

60 HP up to 1600 HP, 40 KW to 1000 KW AC or DC Sets. Attractive Prices. Write for latest listings.

Write — Wire — Phone

ROBERT L. NEISWANDER
415 S. Pears Ave. — Lima, Ohio

300 ft. 6" pipe. 3,000 feet 3 inch pipe.
100 tons 12 to 35 pound mine rail.
One 1,500 CFM Ingersoll Rand Imperial type 10 compressor.
24 x 42 steel frame building.
Double drum air hoist.
Mine Timber Framing Saws.
Transformers, 200 KVA. Down large air receivers.

Box 609 — Yerington, Nevada

CONCENTRATING TABLES
4—6' x 16' Deister Type, New Rubber Decks — Motorized.
1—6' x 16' Butchart, New Rubber Decks—Motorized.

DIESEL GENERATORS
3—D-13000 Caterpillar Diesel Engines, direct connected to 75 KW, 440 volt AC Generators.
1—D-4400 Caterpillar Diesel Power Unit, V-belted to 220 volt AC Generator.

THICKENERS
1—20' x 8' Dorr—Fit Tank.
1—20' x 8' Booth-Thompson—Fit Tank.

CRUSHING ROLLS
1—32" x 16" Davis Crushing Roll, Flat Pulley Drive.

SAMPLE CUTTERS
3—Gen. Engr. Wet Sample Cutters, with Gearhead Motors.

VIBRATING SCREENS
1—3' x 6' Plat-O, Single Deck.
1—3' x 6' Tyler-Niagara, Single Deck.

FILTERS—DISC
2—4', 6-disc, Elmco Filters, with Vac. Equipt.

FLOTATION MACHINES
4—#24 Denver, "Sub-A," 8-cell, Wood Tank.
1—#18 Welnig, "Sub-A," 8-cell, Steel Tank.

PUMPS—SAND
6—2" Willfleys—Rubber Lined—Motorized.
1—1½" Denver Equipment, Vertical—Motorized.

BALL MILLS
1—#45 Marcy.
1—#84 Marcy.
1—4' x 7' Allis Chalmers.

AIR COMPRESSORS
1—8⅜ x 4¾ x 5 Chicago Pneu. Air Compressor, 277 cu. ft. Cap., V-belted to D-4400 Caterpillar Diesel Engine.

MAGNETIC PULLEYS
1—24" x 28" Face Dings Magnetic Pulley with head and tail mechanism, 5'6" centers, with charger, gearhead motor driven.

NEW MOTORS
15—¾ HP, New Leland Sgl. Ph. Motors.
10—1/3 HP, New Leland Sgl. Ph. Motors.
5—½ HP, New Leland Sgl. Ph. Motors.
2—1½ HP, New Leland Sgl. Ph. Motors.

CLASSIFIERS
1—60" x 23' Denver Simplex Cross-flow Classifier.
1—6' x 22' Dorr Type Duplex Classifier.

BULLETINS SENT UPON REQUEST

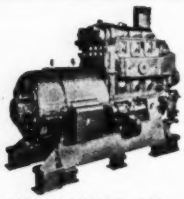
FLORENCE MACHINERY AND SUPPLY CO.

904 Equitable Bldg. **Denver 2, Colorado**

AIR COMPRESSORS
9 Electric 5000, 3176, 2200, 1528 & 1302 ft.
6 Diesel 1578, 1000, 676 & 500 ft.
LOCOMOTIVES
7 Diesel 80, 65, 45, 30 & 20 Ton.
22 Gas, 35, 25, 16, 12, 8 & 6 Ton.
R. R. CARS
150 Dump Cars, 2, 4, 12, 20 & 30 Yd.
100—50-Ton Flat Cars. 66—50-Ton Gondolas.
150—8,000 Gal. Cap. Tank Cars. 33 Box Cars.
STEEL STORAGE TANKS
2—74,000 Bbl. Cap. Vert. 114'7" x 40'.
12—10,000, 15,000, 20,000 & 25,000 Gal. Horiz.
LARGE JAW CRUSHERS
7—60x84, 40x48, 36x42 & 24x36.
ROTARY DRYERS & KILNS
70" x 35' Indirect Ruggles Coles XB-10.
54" x 40' Louisville Steam Tube.
4' x 20' Ruggles Coles XA-2.
Single Shell Direct 4 x 30, 5 x 35, 5 x 40, 5 x 50, 5½ x 40, 6 x 26, 6 x 28, & 6 x 30.
Kilns 9 x 160, 6'3" x 120, 5 x 50.
BALL, ROD & TUBE MILLS
8' x 48" Hardinge Conical Ball Mill.
6' x 22' Hardinge Conical Ball Mill.
7' x 5', 4' x 8' Cylindrical Ball Mills.
4' x 4' Allis Chalmers Ball Granulator.
7' x 18' Allis Chalmers 2 Compartment Mill.
5' x 6' Pebble Mill.
3 x 8, 4 x 8 & 7 x 16 Rod Mills, Marcy, Hardinge.
5 x 22 Allis Chalmers Tube Mill.
4 x 16 & 5½ x 20 Tube Mills, Steel & Silex Lined.
PULVERIZERS
#1½ Sturtevant Ring Roll Mill.
6' x 48' Hardinge Mill with Air Classifier.
4 Roll Low Side Raymond Mill.
#50 Raymond Imp. Mill.
26" Allis-Chalmers Inter-Plane.
STANHOPE, 60 E. 42nd St., New York 17, N. Y.

Rotary Kilns—6½' x 70' & smaller.
Rotary Dryers—3' x 30'—4' x 30'—6' x 40'—5½' x 50'—6½' & 8½' x 60' & 8' x 70'.
Tube & Ball Mills—6' x 9'—5' x 22'—5½' x 10'.
Fuller-Lehigh Mills—22"—47" & 52"—Bradley Mills.
Jaw Crushers—From 10" x 6" up to 38" x 24".
Crushing Rolls—From 16" x 10" up to 72" x 20".
1—7' Newhouse Crusher, latest type.
Sturtevant Rotary fine crushers No. 0—No. 1—No. 1½ and No. 2.
Ring Roll Mills—Sturtevant No. 1—No. 2
15'—18' & 18' Herreshoff furnaces.
6' x 15' Bruckner roaster.
Gyratory Crushers, No. 3 and No. 12.
8—14' air separators.
Magnetic separators—Jigs—screens—Classifiers and thickeners.
5', 6' & 7' dia Rod Mills.
Mine Hoists.
One 4 roll Raymond Mill, low side.

W. P. HEINEKEN
227 Fulton St., N. Y.



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HEMCO

1000 KW, 2400 Volts, 3 Phase, 60 Cycle, 720 RPM, General Motors Model 16-278A
750 KW, 2400 Volts, 3 Phase, 60 Cycle, 720 RPM, General Motors Model 12-567
600 KW, 2400 Volts, 3 Phase, 60 Cycle, 1200 RPM, General Motors Model 8-268A
300 KW, 450/2400 Volts, 3 Phase, 60 Cycle, 1200 RPM, General Motors Model 8-268A
200 KW, 450/2400 Volts, 3 Phase, 60 Cycle, 1200 RPM, General Motors Model 8268A
50 KW, 440 Volts, 3 Phase, 60 Cycle, 900 RPM, airbanks-Morse Model 36A 5½
100 KW, 3 Wire, 125/250 Volts DC, 1200 RPM, General Motors Model 3-268A
900 HP, General Motors Model 12-567, Propulsion Unit Complete

HERCULES ELECTRIC MACHINERY and EQUIPMENT CO.

Tel. NEvada 6-2808—Cable Address HEMCOY 1412-18 So. Alameda St., Compton, Calif.

BOILERS

10 to 1000 H. P.
NEW-USED RECONDITIONED
Steam, Gas and Electric Power Equipment

J. PARKER THOMPSON CO., INC.
507 FIFTH AVE., NEW YORK CITY
MURRAY HILL 7-6547-8-9

DIESEL GENERATOR UNITS

IN STOCK—IMMEDIATE SHIPMENT

2—1420 KVA—FAIRBANKS MORSE—NEW ALTERNATORS DIRECT CONNECTED TO FAIRBANKS MORSE MODEL 38D8⅛—1600 HP—720 RPM—DIESEL ENGINES.
2—1250 KVA—CROCKER WHEELER—NEW ALTERNATORS DIRECT CONNECTED TO FAIRBANKS MORSE MODEL 38D8⅛—1600 HP—720 RPM—DIESEL ENGINES.
4—125 KVA—WESTINGHOUSE—3-60-450 VOLT—GENERATORS DIRECT CONNECTED TO GENERAL MOTORS MODEL 3-268A—150 HP—1200 RPM—DIESEL ENGINES.
2—620 KW—240 VOLT—DC GENERAL ELECTRIC GENERATORS DIRECT CONNECTED TO ALCO TYPE 6—12½x13-T—900 HP—700 RPM—DIESEL ENGINES.
2—100 KW—120 240 VOLT—3 WIRE—DELCO GENERATORS DIRECT CONNECTED TO GENERAL MOTORS MODEL 3-268A—150 HP—DIESEL ENGINES.

ENGINES NEW LATE 1944—RELATIVELY FEW HOURS OPERATION

DEPT. A

WALTER H. WILMS & COMPANY

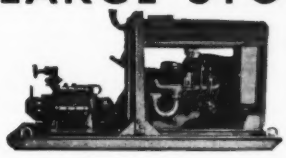
2526 GUARDIAN BUILDING DETROIT 26, MICHIGAN
Phone: Woodward 1-1856 and 1-1857

NON-CORRODING PIPE FOR SALE

Textolite lightweight non-metallic pipe manufactured for the Government by General Electric Co. and now surplus. Unused. Resists the effects of corrosive waters and atmospheres, chemical salts and solutions, solvents, gasolines, etc. A high pressure pipe, 5" O.D. with ¼" wall. Offered below iron pipe prices, although original cost and present manufacturer's price is several times that of iron pipe. Available with plain ends or standard threads. Couplings of similar material also available. Prices, specifications and technical data, with a sample of material free on request. This material will stand the most rigid technical examination.

VEG-ACRE FARMS
Irrigation Division
Forestdale, Mass.

Mining and Concentrating Machinery
LARGE STOCK-FULLY RECONDITIONED



GAS ENGINE DRIVEN PUMPS
17—2" New Jaeger Direct Connected to 2½ HP. Wisconsin Gas Engines.
2—2½"x1½" Economy 4-stage Pumps driven by 59 HP. Chrysler Gas Engines.

SAND PUMPS
1—2" Wellsy Sand Pump.
1—3"x3" Allen-Sherman-Hoff "Hydroseal" Rubber Lined Pumps.
1—3" Telluride Sand Pump.
1—4" Traylor Sand Pump.

CENTRIFUGAL PUMPS
5—1" New Ing.-Rand Centrifugal Motor Pumps.
1—1" Buffalo Split Case Centrifugal Pump.
1—1½" Fairbanks Morse Centrifugal Pump.
35—1½" New Deming, mounted on Reeves adjustable bases with new 1½ HP. mot.
1—2" Worthington Centrifugal Pump.
1—3" Durlron Centrifugal Pump.
1—2½" Ing.-Rand Model VV Cent. Pump.
2—3" Worthington Centrifugal Pumps.
1—4"x4" American Cent. Sludge Pump.
1—5" Aurora Double Section.
7—5" Ingersoll-Rand Motor Pumps.
1—6" Krogh Centrifugal Pump.
1—7" Fairbanks Morse Centrifugal Pump.
1—12" Morris Centrifugal Pump.

MULTI-STAGE CENTRIFUGAL PUMPS
1—2" Hill 4-stage Centrifugal Pump.
4—2½" Pennsylvania 4-stage.
2—3" United 5-stage Centrifugal Pumps.
3—4"x3" Allis-Chalmers 4-stage.
2—6" Manistee 8-stage Centrifugal Pumps.

SINKING PUMPS
1—2½" Krogh Centrifugal Sinking Pump.
1—3" Krogh Centrifugal Sinking Pump.
1—4" Johnson 8-stage Sinking Pump.
1—14" Layne & Bowler 10-stage Sinking Pump.

VERTICAL CENTRIFUGAL PUMPS
1—1½" Tabor Vertical Centrifugal Pump.
1—3½" American Vertical Cent. Pump.
1—4" Aurora Vertical Centrifugal Pump.
1—5" Aurora Vertical Centrifugal Pump.

PISTON PUMPS
1—1½" McDonald Simplex Pump.
1—4"x5" Deming Horizontal Double Acting Power Pump.
1—6"x10" Deming Horizontal Double Acting Power Pump.
2—6"x12" Goulds Horizontal Double Acting Power Pump.
1—4"x6" Fairbanks-Morse Horizontal Duplex Power Pump.
1—6"x10" Gardner-Denver Horizontal Duplex Power Pump.
1—7"x12" Worthington Horizontal Duplex Power Pump.
1—2"x3" Douglas Vertical Triplex Pump.
1—2½"x4" Deane Vertical Triplex Pump.
1—3"x3" Deming Vertical Triplex Pump.
1—3½"x4" Aldrich Horiz. Triplex Pump.
1—2½"x6" Goulds Vertical Triplex Pump.
1—3½"x6" Goulds Vertical Triplex Pump.
1—5"x8" Goulds Vertical Triplex Pump.
1—6"x8" Deane Vertical Triplex Pump.
1—6"x7" Aldrich Vertical Triplex Pump.
1—7"x8" Goulds Vertical Triplex Pump.
1—9"x10" Deane Vertical Triplex Pump.

SUMP PUMPS
6—3" New Chicago-Pneu. Air Driv. Rotary.
1—Ing.-Rand ☰35 Air Driven Rotary.
1—4" Krogh Vertical.

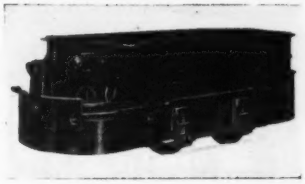
STEAM PUMPS
1—7"x4½"x6" Gardner-Denver Duplex
1—7"x4½"x8" Snow Duplex.
2—7½"x3"x10" Gaso Duplex.
1—7½"x4½"x10" Epping Carpenter Duplex.
1—8"x5"x10" Gardner-Denver Duplex.
2—10"x4½"x10" Gaso Duplex.
1—8"x5"x13" Cameron Simplex.
1—10"x6"x13" Cameron Simplex.

VACUUM PUMPS
2—4"x4"x2⅔" Ingersoll-Rand Vac. Pumps.
3—4½"x3½" Gardner-Denver Vertical.
1—2½"x4" Colorado Iron Works.
1—8"x10" Buffalo.
1—12"x12" Buffalo.
1—18"x12" Worthington.

TUGGER HOISTS
3—5 HP. Ingersoll-Rand 2-drum Slusher Hoists, Model 3SN5DH, 3/60/440.
1—20 HP. New Ing.-Rand 3-drum Slusher. Hoist, Model 20-MNM-2D, 3/60/440.
1—25 HP. Ingersoll-Rand 3-drum Slusher Hoist, Model 25-NNN-3D, 3/60/440.
12—Ing.-Rand Size EU Air Tugger Hoists.
1—Ing.-Rand, Model 6HC Air Tugger Hoist.
3—6½ HP. Sullivan Single Drum Tugger Hoists, Type HE, 250 volts DC.
9—6½ HP. Sullivan Double Drum Tugger Hoists, Type HDE, 250 volts DC.
1—25 HP. Sullivan Double Drum Slusher Hoist, Type B-211, 220/440.

HOISTS
2—10 HP single drum, flat friction, Elec.
1—15 HP single drum Morse Bros., Elec.
1—20 HP single drum H & B, Electric.
1—37 HP single drum, Electric.
1—50 HP single drum English, Electric.
1—50 HP single drum Fairbanks-Morse, Electric.
2—☰22C Vulcan single drum, Electric.
1—☰1½ Vulcan double drum, Electric.
2—☰4½ Vulcan single drum, Electric.
1—60 HP. Vulcan ☰3ELF single drum, Electric.
1—150 HP. single drum, Electric.
1—300 HP. Ottumwa double drum, Electric.
1—9"x10", 3-drum American Steam.
1—15 HP. 2-drum Contractors, gas engine driven.
1—25 HP. 2-drum Contractors, gas engine driven.
3—80 HP. 3-drum Contractors type.
1—100 HP. single drum, Steam.
13—Ingersoll-Rand size EU. Air Tugger.

BLOWERS
1—☰5 Spencer Turbo Blower with 3 HP. mtr.
1—☰2 Robinson Type HFBC Exhaust Fan.
1—☰6E Buffalo Exhausting Blower.
1—☰4B Champion Exhaust Fan with 7½ Hp. motor.
23—Type 250-EL American Exhausting Fans.
1—☰6 Buffalo Exhausting Fan.
3—☰250 D.F.C. Furnace Blowers.
1—North American Furnace Blower, 825 CFM, with 7½ HP. motor.
2—☰5 Sturtevant Pressure Blowers.
1—☰7 Sturtevant Pressure Blower.
1—☰8 Sturtevant Pressure Blower.
2—☰10 Buffalo Cupola & Forge Blowers.
1—☰1 Roots Rotary Blower.
1—☰5 Connersville Positive Pressure Bl'wer.
1—☰5 Roots Positive Pressure Blower.
1—☰7 Roots Rotary Blower.
1—☰3 American "Sirroco" Steel Plate Exhauster.
1—☰50 American Steel Plate Exhauster.
1—☰60 Sirroco Steel Plate Exhauster.
1—☰6 Sturtevant Volume Blower.
1—☰8 Sturtevant Volume Blower.
1—☰24-SF New Mueller Volume Blower.
16—Type HS New American Volume Blowers, 12,000 CFM, direct driven by 12½ HP. motors.
21—Type HS New American Volume Blowers, 42,000 CFM, direct driven by 12½ HP. DC motors.



LOCOMOTIVES
2—2 to 2½ ton Mancha Battery, 18" gauge.
1—2 to 2½ ton Whitcomb Battery, 24" ga.
2—5 ton Westinghouse Battery Locomotives, 36" gauge.
2—7 ton General Electric Permissible Type Battery Locomotives, 36" gauge.
1—7 ton Mancha Battery, 36" gauge.
2—8 ton General Electric Battery Locomotives, 36" gauge.
4—8 ton Atlas Battery Locomotives, 36" ga.
3—6½ ton General Electric Trolley Locomotives, 36" gauge .
1—5"x16" Porter Compressed Air Locomotive, 18" gauge.
1—5½"x16" Baldwin Compressed Air Locomotive, 30" gauge.
1—3 ton Whitcomb Gas. Driven, 24" gauge.
1—8 ton Ruth Gasoline Driven, 18" gauge.
1—50 ton Brooks Steam Locomotive with tender, 36" gauge.
2—18 ton Davenport Steam Locomotives, 1—36" gauge, 1—Standard gauge.

CONCENTRATING TABLES
2—Half size Wilfley No. 12 Tables.
35—Deister "Plat-O" left hand Tables.
26—Deister "Plat-O" right hand Tables.
10—Wilfley No. 6 right hand Tables.
1—Wilfley No. 6 left hand Table.
1—Wilfley No. 11D right hand Table.

JAW CRUSHERS
1—8"x8" Universal semi-steel crusher.
1—8"x24" Rogers cast steel crusher.
1—9"x16" Cedar Rapids All Steel Crusher.
1—8"x36" Universal all steel crusher.
1—15"x20" Universal all steel crusher.
1—24"x36" Traylor type A Blake crusher.

GYRATORY CRUSHERS
1—☰8 Kennedy-VanSaun roller bearing.
1—☰37 Kennedy-VanSaun type S roller bearing fine reduction crusher.
1—10" Traylor "Bulldog" type T crusher.

BALL AND ROD MILLS
1—36"x24" new Morse Bros. Batch Mill.
1—1'x4' New Ball Mill.
1—5'x22" Hardinge Conical Ball Mill.
1—6'x8' Marcy Ball Mill.
1—8'x22" Hardinge Conical Pebble Mill.
1—3'x8' Denver Engr. Works Tube Mill.
1—3'x9' Ruth Rod Mill.

MISCELLANEOUS EQUIPMENT
1—27"x14" McFarlane Crushing Rolls.
1—3'x4' Oliver Drum Filter.
1—3" Symons Cone Crusher.
2—52 HP. General Electric Slipring Motors, 3/60/440, 900 RPM.
2—3'x5' Tyler "Hummer" Vib. Screens.
1—66"x40' Steel Tank, 7109 gal. capacity.
1—11" Telescope Gurley Transit.
1—36"x20' Dorr Duplex Rake Classifier.
3—12B Elmco Rocker Shovel Loaders.

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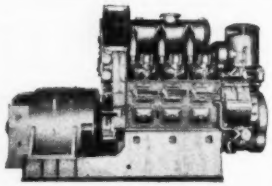

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General Motors Marine Diesel, 6 cyl., 2 cycle, 600 shaft horsepower, complete with General Electric D. C. generator, 300 kw. Full accessories. Eight boxes brand new spare parts. Exhaust muffler.

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1—Single Drum 60" dia., 42" face, 200 H.P., G.E. Motor, 3 phase, 60 cycle, 2,200 volt, complete with control equipment.

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PULVERIZERS: Hardinge Conical Ball Mill, 6' x 22" manganese steel lined, Herringbone gears with motor and V-belt drive. Jeffrey 24 x 18" Swing Hammer Pulverizer, shop No. 1159.

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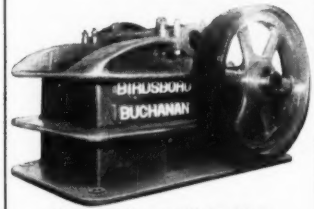

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42"	5	1/8" — 1/16"	20"	5	1/8" — 1/32"
36"	6	1/8" — 1/16"	20"	4	1/8" — 1/32"
30"	6	1/8" — 1/16"	18"	4	1/8" — 1/32"
30"	5	1/8" — 1/16"	16"	4	1/8" — 1/32"
26"	5	1/8" — 1/32"	14"	4	1/16" — 1/32"
24"	5	1/8" — 1/32"	12"	4	1/16" — 1/32"

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	16"	6	10"	5	5"	5
	14"	6	8"	6	4"	5
	12"	6	8"	5	4"	4
	12"	5	6"	6	3"	4

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	25 "	16.00
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	50 "	15.00	1.50 Pair
1"	25 "	10.00	1.50 Pair
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I.D. Size	Length	per Length	I.D. Size	Length	per Length
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	50 "	8.00		40 "	12.00
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1¼"	25 "	7.50		35 "	14.00
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STRONG AND TOUGH!

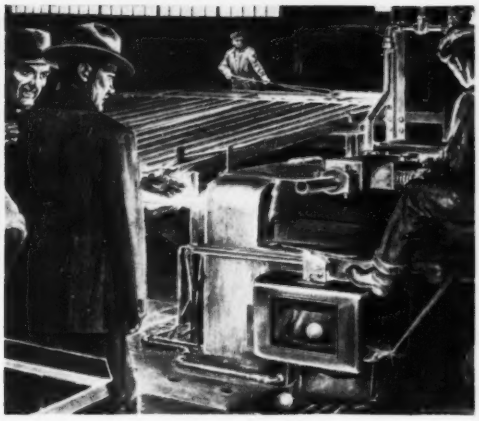
GARLOCK 7021 Compressed Asbestos Sheet Packing. Gaskets, styled GARLOCK 7022 in all sizes and shapes.

GARLOCK 7021 is a strong, dense, compressed asbestos sheet. This gasketing material is sufficiently compressible to compensate for normal irregularities in flange faces, but resistant to plastic flow under heavy bolt loads. Withstands extreme pressures and high temperatures. Specially recommended for severe oil and steam service.

THE GARLOCK PACKING COMPANY
PALMYRA, N. Y.

In Canada: The Garlock Packing Company of Canada Ltd., Montreal, Que.

GARLOCK
7021
COMPRESSED ASBESTOS
GASKET SHEET



FORGED to a PURPOSE

FORGING CF&I GRINDING BALLS

• *Hot forging is just one of the many steps in the process of producing quality CF&I Grinding Balls . . . a process developed from 75 years' experience in meeting the needs of the mining industry.*

CF&I Grinding Balls *are* forged to a purpose . . . that purpose, the *most effective and uniform grinding.* They are hot-forged of tough, abrasion-resisting steel . . . they are carefully heat treated to obtain uniform wearing qualities . . . they stay round, thus provide maximum grinding surface through their long life—for *most effective and uniform grinding.*

OTHER CF&I PRODUCTS FOR THE MINING INDUSTRY

• Wickwire Rope • Industrial Screens • Grinding Rods • Mine Rails and Fastenings • Rexlock Fence • Clinton Welded Wire Fabric • Grader Blades & other Cutting Edges

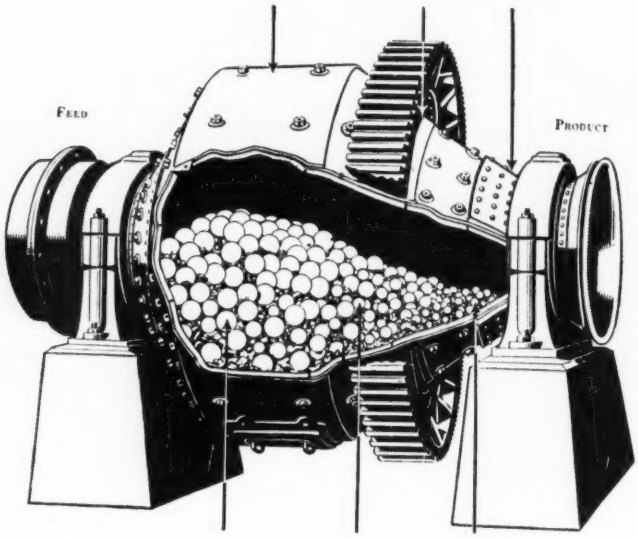
CF&I FORGED STEEL GRINDING BALLS
The Colorado Fuel and Iron Corporation
General Offices: Denver, Colorado
PACIFIC COAST SALES — THE CALIFORNIA WIRE CLOTH CORPORATION — OAKLAND, CALIFORNIA

HARDINGE CONICAL MILLS

for

Best Metallurgy . . . Lowest Metal Consumption

Comparative % critical speeds { 75% 65% 50%



Zone 1	Zone 2	Zone 3
3 in. Balls	2 in. Balls	1 in. Balls
3 ft. drop	2 ft. drop	1 ft. drop
Energy	Energy	Energy
12 ft. lbs.	2 ft. lbs.	0.2 ft. lb.

REASONS WHY . . .

1. Grinding energy is roughly proportional to size of particles in any zone, saving power.
2. Outlet unrestricted — circulating load controlled at will — no mill choking.
3. Speed ranges from about 75% of critical in the cylinder down to 50% near the discharge trunnion. —An ideal condition to reduce ball consumption and power.
4. Rapid scavenging of excess fines —flow velocity at discharge greater than at feed end.
5. Power concentrated on grinding size range desired only — overall power-per-ton cost reduced.
6. Ball and liner consumption is KNOWN TO BE LESS — big balls, at feed end only, don't wear out little balls, or discharge end lining.

HARDINGE

COMPANY INCORPORATED

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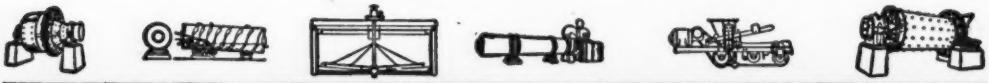
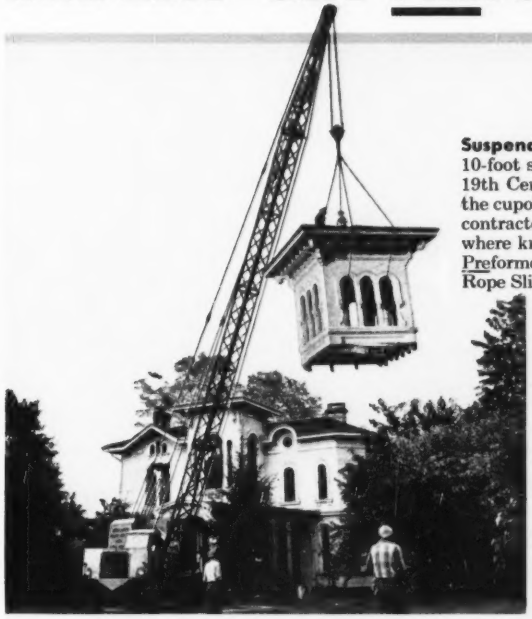


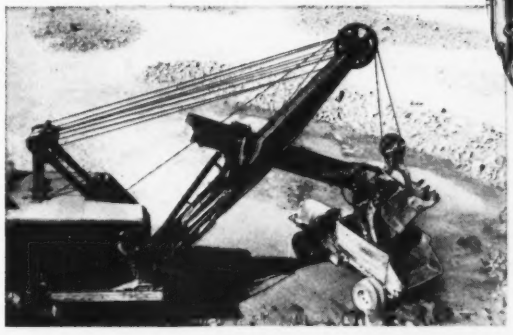
CONICAL MILLS | COUNTER CURRENT CLASSIFIERS | THICKENERS CLARIFIERS | RUGGLES COLES DRYERS | CONSTANT WEIGHT FEEDERS | TUBE ROD AND BATCH MILLS

Improved Performance with LAY-SET PREFORMED



Suspended between heaven and earth is this 4-ton, 10-foot square cupola which enhanced the beauty of a 19th Century building. Serving only as an ornament, the cupola was finally condemned. Here was a job for a contractor with the right equipment. Contractors everywhere know that the *improved performance* of LAY-SET Preformed Wire Rope . . . and Acco Registered Wire Rope Slings . . . makes any job easier . . . reduces costs.

Up-to-date hoisting machinery, an alert operator, and LAY-SET Preformed Wire Rope mean greater safety and freedom from shutdowns. Coal mine, iron mine, "moly" mine . . . wherever a hoisting or haulage rope is used . . . LAY-SET Preformed means *improved performance.*



Down in the pit, out on the road, the power shovel digs in and changes the earth's profile. Rope life may be long . . . or short. LAY-SET Preformed is engineered to give *improved performance* . . . to make the rope last longer.

***Improved performance** comes from a combination of top quality wire rope PLUS correct recommendations. Hazard offers you this combination in LAY-SET Preformed PLUS a nation-wide distributor organization. Always ask for LAY-SET Preformed . . . the Green Strand Wire Rope.*

LAY-SET Preformed GREEN STRAND WIRE ROPE

ACCO *In Business for Your Safety*

TRADE MARK

HAZARD WIRE ROPE

A DIVISION OF AMERICAN CHAIN & CABLE

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Tacoma, Seattle, Bridgeport, Conn.

Industry setting new standards of accuracy with new TIMKEN® "Double-Zero" bearings!

UNTIL recently, the most accurate Timken® bearing on the market has been the "Zero" bearing, with a maximum run-out of only 150 millionths of an inch. Then, just a few short months ago, The Timken Roller Bearing Company introduced the "Double-Zero" bearing, with a maximum run-out of 75 millionths of an inch—*twice* as accurate as the Timken "Zero" bearing!

Within the short time since, one industry after another has begun to take advantage of the increased accuracy of the new "Double-Zero" bearing by applying it on grinding machine spindles, small precision rolling mills, gear cutters, lathe spindles, and many other applications where extreme accuracy is essential.

"DOUBLE-ZERO" BEARING IS A "GENERATED UNIT ASSEMBLY"

To achieve the extreme accuracy of the "Double-Zero" bearing, Timken engineers built specialized machine tools, developed measuring devices of extreme accuracy, and perfected new manufacturing processes.

Then, to assure positive roll alignment, long lasting precision, permanent adjustment, and smoother operation, the "Double-Zero" bearing goes through an extra step in manufacture. A natural and true geometric contact is generated between all rotating parts, which results in a "Generated Unit Assembly".

The new "Double-Zero" bearing is the latest example of Timken leadership in serving the bearing needs of all industry. Whenever you buy bearings, it pays to look for the trade-mark "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

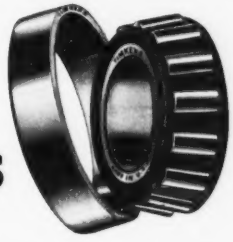
This symbol on a product means its bearings are the best.

A PRECISION TIMKEN BEARING FOR EVERY REQUIREMENT			
CLASS	**"00" (DOUBLE-ZERO)**	**"0" (ZERO)**	**"3" (THREE)**
RUN-OUT	.000075"	.000150"	.000300"
TYPES AVAILABLE	Standard Single Row	Standard Single Row	All types
SIZE RANGE	Up to 10" O.D.	Up to 12" O.D.	Up to 12" O.D.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ◯ NOT JUST A ROLLER ◯ THE TIMKEN TAPERED ROLLER ◯ BEARING TAKES RADIAL ◯ AND THRUST ◯ LOADS OR ANY COMBINATION